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ABSTRACT

These papers produced for a research project and seminar discuss from different conceptual, methodological, and practical perspectives the use of information systems to help improve the urban and regional planning process in developing countries, particularly in Asia and the Pacific. The 15 papers are: (1) "Assessing the Context for Information Systems for Urban and Regional Planning in Developing Countries" (Hidehiko Sazanami); (2) "Information Systems for Urban and Regional Planning: A State of the Art Review" (J. S. Edralin); (3) "Urban and Regional Statistics in Developing Countries" (Peter Nijkamp); (4) "Communication on the 1981 Pacific Islands Pilot Project on Environmental Statistics and the Fiji Field Test and Integrated Area Development and Communication and Information Systems" (Luciano Minerbi); (5) "Information Systems in Urban and Regional Planning" (Christian P. Averous); (6) "Application of Information Systems in Public Administration" (Itoko Suzuki); (7) "Information Technologies in Government: Organizational and Management Issues" (David Moskovitz and David Mammen); (8) "Monitoring and Evaluation of Local and Regional Planning in Developing Countries, with Particular Reference to Metropolitan Regions" (Ian Masser); (9) "The Capital Programming Process and Its Implementation" (Larry Reich); (10) "Urban Transportation Planning Information Systems for Use in Developing Countries" (Marvin Manheim and Joseph L. Schofer); (11) "Information System for Planning in Malaysia: The Case of KEVIS in Kelang Valley" (Johari bin Mat); (12) "Information System for Regional and Local Development Planning in the Metropolitan Manila Commission" (Elena M. Panganiban); (13)

"Information System for Planning in Seoul Metropolitan Region" (An-Jae Kim); (14) "Information Systems for Planning in Bangkok Metropolitan Area" (Kiat Chivakul); and (15) "Critical Perspectives on Information Systems for Urban and Regional Planning" (J. S. Edralin). Numerous graphic illustrations and tables are included, and a list of contributors, including addresses, is appended. (KM)

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INFORMATION SYSTEMS FOR URBAN AND REGIONAL PLANNING

Asian and Pacific Perspectives

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INFORMATION SYSTEMS FOR URBAN AND REGIONAL PLANNING

Asian and Pacific Perspectives

United Nations Centre for Regional Development, Nagoya Japan

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FOREWORD

Information Systems for Urban and Regional Planning formed the theme of a United Nations Centre for Regional Development (UNCRD) research project, as well as an international seminar jointly organized and sponsored by UNCRD and the Kawasaki City Government on 3-6 October 1984 in Kawasaki City, Japan. The expert and scholarly papers and country case studies produced for the research project and seminar have highlighted from different conceptual, methodological, and practical perspectives the use of information systems to help improve the urban and regional planning process. It is gratifying to include some of the papers in this volume.

The research findings suggest that the prospects for implementing information systems in the developing countries, particularly the Asian and Pacific countries, will be a long-term achievement which will only come with increased awareness and understanding of the role of information systems in urban and regional planning, and with improvements in the administrative and technical capabilities of urban and regional planners to use such information systems. These scholars and practicing planners from different disciplines have distilled their ideas, findings, and evaluations on the state of the art of information systems for urban and regional planning. The publication of this volume is intended by UNCRD to provide another opportunity for such increased awareness of the use and application of information systems in urban and regional planning. We are pleased to present here their vital and stimulating contributions.

Special credit must be given to the contributors for presenting their papers and studies in ways useful to both planners and information specialists. They are Christian P. Avérous, Johari bin Mat, Kiat Chivakul, An-Jae Kim, David Mammen, Marvin Manheim, Ian Masser, Luciano Minerbi, David Moskovitz, Peter Nijkamp, Elena M. Panganiban, Larry Reich, Joseph L. Schofer, and Itoko Suzuki.

FOREWORD

We acknowledge the generous assistance of the Kawasaki City Government and the city officials and officers in hosting and cosponsoring the Kawasaki International Seminar on Information Systems for Urban and Regional Planning.

Finally we will take this opportunity to publicly express our thanks for the behind-the-scenes efforts and contributions of Josefa S. Edralin, UNCRD Information Systems Planner, who coordinated Phase I of the Research Project on Information Systems for Local and Regional Development; Hideaki Hoshina, UNCRD Physical Planner, who has acted as Seminar Coordinator; James F. Goater, UNCRD Documentation Assistant, who drew the graphics and prepared the cover design; and Taeko Yamakawa, Secretary, who typed and retyped innumerable drafts of the chapters on the word processor with patience and good cheer.

Hidehiko Sazanami

30 January 1986

Hidehiko Sazanami
Director, UNCRD

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INTRODUCTION

ASSESSING THE CONTEXT FOR INFORMATION SYSTEMS FOR URBAN AND REGIONAL PLANNING IN DEVELOPING COUNTRIES

Hidehiko Sazanami

The implication of information systems for planning has often been studied and debated, but has less often been explored in a rigorous and coherent manner which integrates both conceptual and empirical aspects including the use and application of information systems for urban and regional planning.

Information systems are the "operational keystone" of the urban and regional planning process. Without effective information systems, such a process is impossible. The argument is that information systems will improve urban and regional planning performance.

Information systems may be defined as the organization of data relevant to understanding, planning for, and monitoring and evaluation of urban and regional development. They serve various needs, such as increasing planning capability and providing information on which to base the delineation and evaluation of alternative courses of action. Specifically, information systems perform three essential functions: (a) they identify the information required for planning, implementation, and monitoring and evaluation; (b) they utilize methods of collecting, processing, analysing, and disseminating data that meet standards of accuracy, timeliness, and costs; and (c) they provide an organizational structure which brings users and suppliers of information in constant dialogue.

In developing countries, very few large cities and subnational regions have adopted modern information technology. In organizations which have started to use computer technology in information handling, it has so far not produced significant changes in the setup of city or regional administration, in the structure of decision making, or in the actual work of the planning and decision making agencies. What have been achieved in most cases, are incomplete inventories of baseline data about economic, social, cultural, political, and physical features of the environment, and the automation of routine, recordkeeping applications, primarily in finance and other revenue-maximizing services. Experiments or endeavours toward urban or regional planning information systems are very recent and still evolving. The concept of "urban or regional information systems package" has not yet penetrated governmental policy in developing countries. The concept is not yet included in governmental programmes, intergovernmental mechanisms for coordinating national and local efforts, professional networks, and research and training programmes in colleges and universities.

What are the reasons for the retarded development of computer-based planning information systems in developing countries? Some of the reasons are found in the acute lack of funds and qualified staff in urban and regional planning and computer services, poorly developed communications infrastructure to support the information systems, lack of organized procedures to accept technology transfer from developed countries, and lack of technological know-how. There are opposing views that computer technology will either prove to be a blessing or a curse to planners in developing countries. Those who are pessimistic about the positive effects or impacts of computer technology on development and planning efforts tend to point to the difficulty of building sophisticated analytic, forecasting, planning, and decision making applications. They fear that the acceptance and implementation of computerized information systems might create more problems than it solves. They stress that developing countries need less sophisticated planning models and less rigorous methodologies for data collection and analysis.

Some of the significant issues in the development of planning information systems in developing countries concern those of the goals, or desired outcome of the operation of urban and regional planning information systems; the policy environment which makes the need felt for information systems; the data sources; methods of data collection and analysis; urban and regional data problems; and data processing.

Urban or regional planning information systems consist of three components, namely, bibliographic, planning, and administrative management subsystems. These components include baseline data, plan implementation data, and monitoring and evaluation data. However, the content of information systems is really of less importance than their purpose. If information systems are to play an important role in urban and regional planning, they should meet planning needs. There are many obstacles to the fulfillment of these needs. In developing countries there are two crucial data deficiencies which are extremely difficult to fill. These are (a) information on local situations, and (b) systematic and disaggregated data on regional product or value added per head, population, income patterns, employment, migration flows, and industry. There is also a need for consistency and standardization of data sources in terms of time, geographic area, or definition. The lack of access to specialized information is another problem. In developing countries geological or natural resources data are frequently considered confidential, and obstacles to their use exist even for urban and regional planners. The definition of the word "official" places constraints on the already limited availability of statistics not specifically cleared for dissemination by the State. In some countries "official" information is presumed to be confidential. The challenge for planners in developing countries, therefore, is not so much planning without data, but rather making the best use of that which is available.

The legal context, i.e., the administrative and institutional environment for information systems varies from country to country. So do the planning organization, the planning process, the time horizon of the plan, the orientation or objective of the plan, the specific subject of the plan, and the size of cities and regions. Hence, the information required for urban and regional planning differs with individual countries, governmental levels, programmes, projects, and localities. The problem is then to identify a "shopping list" of all the aspects and items of information that are likely to be covered in the urban or regional planning process.

The effectiveness of urban and regional policies and the development of efficient information systems depend upon a continual flow of accurate and up-to-date planning information from the local to the central government and vice-versa. The organization of a two-way information flow is one of the most controversial issues facing local planners in developing countries. It is sometimes feared that the flow of information from local governments enables central governments better to control and dominate them. But if an agreed conceptual framework exists, and freedom of information is assured, there will be more interaction between local and national planners.

Data collection and analysis depends greatly upon local situations and user needs. Deciding what to collect and how to collect it should be the main concern of those involved in data collection. The issue is whether to use existing data sources (i.e., conduct secondary analysis based on censuses, administrative records, data from the sectoral departments, maps, and aerial photographs), or collect new data (i.e., conduct original research via sample surveys, field visits, observations, informal interviews, and other subjective approaches). It is important to determine which of the approaches are more cost-effective, relevant, timely, accurate, and of actual beneficial use in planning. A balance must be achieved between the economic and administrative costs of gathering data and the usefulness of that data for planning. Some data are difficult and expensive to obtain but most valuable as a measuring tool, while other data are interesting, but overall not worth the collection costs.

There is widespread opinion in national and international forums that there is insufficient participation by the people in urban and regional planning, particularly in data collection. People's participation is important not so much to clarify the best policy choice as to show the advantages and disadvantages that any policy brings to the people in the community. When given the opportunity, people are willing to cooperate and react to different proposals which affect their immediate interests. But participation only happens when information reaches people. Taking the data and recommendations back to the areas where data had been gathered allows feedback from the people who are in a strong position to judge the feasibility of some of the recommendations.

In developing countries too little attention is given to data processing and analysis. Some government organizations are more interested in conducting or financing surveys than in using their results. Unless the research results reinforce the attitude or political values of the policymakers they are largely ignored. The question is whether this is a deficiency of data analysis which fails to incorporate political values, or whether it is a feature of information systems designed to support political decision making.

For data processing needs, there is a maddening array of technological choices. Developing countries have to consider a range of technological options, including appropriate documentation technology, increased focus on training, and establishment of information exchange networks. It is important that developing countries determine their broad priorities for expenditure on information technology in the future. The basic issue for developed countries is how to assist developing countries in the conversion from traditional manual systems that have become overburdened by the volume of information storage, processing, and retrieval, to computerized information systems for urban and regional planning.

Implicit in all of these issues is the larger question of the role of international cooperation in promoting the use and application of urban and regional planning information systems in developing countries.

The United Nations Centre for Regional Development has been privileged to be able to undertake the research project on information systems for local and regional development, of which the results were presented at the Kawasaki International Seminar on Information Systems for Urban and Regional Planning, held in Kawasaki City, Japan, on 3-6 October 1984. The objectives of the project were to examine the state of information systems for urban and regional planning in developing countries and to evaluate the effectiveness of such systems in delivering information to users. Two specific outputs were included in the project and were seen as required to achieve the objectives: theoretical or concept papers and Asian case studies. The concept papers provide a thorough treatment of the key data and information issues surrounding the technical field for which the paper is prepared. The case studies follow a uniform methodology and provide a descriptive analysis of information requirements and information use in urban and regional planning, data collection and analysis, data processing and information dissemination methods, monitoring and evaluation systems, and organization and management of information systems. The concept papers and case studies are included in this volume.

INFORMATION SYSTEMS FOR URBAN AND REGIONAL PLANNING: A STATE OF THE ART REVIEW (EXECUTIVE SUMMARY)

J. S. Edralin

The role of information systems in urban and regional planning has been discussed in international forums and in planning literature.1/ Previous research had provided information on the nature and extent of the application of information systems in developed countries. The literature has progressed substantially from conceptual and theoretical discussions on information systems to case studies on their design and implementation. Still, the overwhelming preponderance of research on information systems neglects the problems in developing countries.2/ This volume is an attempt in some measure to improve our understanding of the state of the art of information systems for urban and regional planning in developing countries.

In developing countries, urban and regional planning is currently undergoing administrative and organizational transformation. Information systems are being introduced, though at a slow rate, in urban and regional planning organizations or projects, oftentimes with financial support from international and bilateral aid agencies. This powerful new tool is becoming available at a time when the search for improvement in urban and regional planning is gaining increased attention.

While developed countries have made enormous strides in information systems development, experience in implementing information systems built into urban and regional planning in developing countries has revealed a number of problems and issues that hamper the realization of the potential contributions of these systems to the urban and regional planning process. This volume attempts to explore the problems encountered in the development and implementation of information systems. One word of warning is in order, however: the book's perspective may seem somewhat narrow. This is due to the fact that the research project on which the book is based focused mainly on the concept of information systems as it applies to urban and regional planning and on the experience of selected

Asian metropolitan regions. Except for two papers (those by Luciano Minerbi and by David Moskovitz and David Mammen), the papers included in this volume were originally prepared for the United Nations Centre for Regional Development Research Project on Information Systems for Local and Regional Development.[3] All the papers were prepared for the Kawasaki International Seminar on Information Systems for Urban and Regional Planning held in Kawasaki City, Japan on 3-6 October 1984.

The papers are divided into two categories: Concept papers reviewing existing literature and exploring the issues of design, implementation, application and maintenance, and evaluation of information systems for urban and regional planning (presented in Part I of this volume); and Case studies focusing on Asian country contexts and discussing problems and issues of information use, information requirements, data collection, data availability, use of techniques and methods in analysis and application of data, information flows, data processing and information dissemination methods, monitoring and evaluation systems, and organization and management of information systems for urban and regional planning (presented in Part II). The experiences of Bangkok, Kuala Lumpur, Manila, and Seoul were the focal points of the case studies by authors from each country.

CONCEPTUAL AND THEORETICAL PERSPECTIVES

The authors of the concept papers in this volume review the methodological issues and provide examples which demonstrate the use and application of information systems in urban and regional planning. They provide a multidisciplinary view of key issues of design and implementation of information systems.

Peter Nijkamp (Chapter 1) proceeds from a discussion of the general issues of information systems for urban and regional planning to an analysis of specific issues of statistics for urban and regional planning in developing countries. The general issues in designing information systems for urban and regional planning include: (a) planners' need for information (e.g., the need to find a balance between completeness and manageability of statistics, and between centralization and decentralization in the collection and production of urban and regional statistics); (b) distinction between data and information (e.g., the need for trade-offs between costs of information and costs of wrong decisions, as well as the need to reconcile the field of interest of planning and of information systems in the long run); (c) the use of information in three stages of the planning process, i.e., description, impact analysis, and evaluation (e.g., the problem of lack of reliable data, weak data base, and lack of qualitative data); (d) the general methodological criteria for assessing the quality of urban and regional information systems (e.g., availability, actuality, accessibility, consistency, completeness, relevance, pluriformity, comparability, flexibility, measurability, comprehensiveness, effectiveness, versatility, and validity of information), the regional or multiregional elements of urban and regional information systems (i.e., integration, interregional interaction, regional bottlenecks, multiregional decision making, and standardization of information systems), and spatial referencing of regional information; and (e) cross-national comparison of urban and regional information systems in terms of degree of centralization, degree of integration, role of modelling, degree of regional detail, and extent of computerization.

The specific issues of statistics for urban and regional planning in developing countries include: (a) the use and relevance of statistics and information systems for urban and regional planning (e.g., the need for a unifying conceptual and operational framework for information to resolve institutional and integration problems); (b) the problem of data collection and data production (e.g., the need to focus attention on such requirements as manageability and simplicity of data banks for urban and regional planning, time series data, and precise data to implement policy strategies for diminishing socioeconomic discrepancies in space and time; (c) lack of integrated, coherent (partial), and accessible urban information systems (e.g., a satellite design is a useful device for achieving consistency among the various policy fields and for making cross-national comparisons of information systems).

Finally, Nijkamp discusses the desirability of focusing attention on the requirements for designing statistical information systems: (a) coherence in terms of comparability of time series data, comparability of cross-section data, and standardization of classification and synchronization among variables; (b) completeness of statistical data; (c) timely availability of statistical data; (d) sufficient length of time series for research and modelling purposes; (e) reliability of statistical data; and (f) flexibility of statistical data systems to produce data according to a desired regionalization.

Luciano Minerbi's paper (Chapter 2) consists of a summary report on the 1981 Pacific Islands Pilot Project on Environmental Statistics and the Fiji Field Test, and notes on integrated subnational area development. The first study consisted in the feasibility test of a conceptual framework for the organization of environmental statistics which was developed by the United Nations Statistical Office (UNSO). The study is based on a conceptual framework which links cycles of production (economic description), environmental media (environmental description), and human welfare (social description) to categories describing environmental processes, impacts, and policy responses. The study proved the desirability of the UNSO framework for environmental statistics and the technical feasibility to create statistical tables consistent with the framework. However, the adoption of the framework relies on the following conditions:

1. Data collected should describe cycles of production and consumption, media, impacts, human welfare, and policy responses;
2. Processes and environmental phenomena are monitored;
3. Data collection and categorization are interrelated;
4. Environmental priorities of a given country are recognized;
5. Consideration is given to hierarchical and administrative organization and the flow of information between the various administrative levels and geographic jurisdictions within ministries; and
6. Environmental information survey in a given country is consistent with the information management system.

In the second study described by Minerbi, integrated area development (IAD) is considered as an alternative to top-down and bottom-up planning practices. Conceptually, IAD is concerned with organizational structure, communication environment, spatial effects of planning, and community dynamics. The four major elements of this conceptual framework are: communication, information, organizational capacity building, and legislative mandate. The possibility of using IAD to create an environmental statistics and communication system is examined. Minerbi stresses that the planning process has to implement programmes for intervillage information systems, decentralization at the district level, interorganizational coordination, and experimentation in community organization and participation which are necessary in achieving the institutionalization of IAD.

Christian P. Averous (Chapter 3) reviews the trends concerning urban and regional planning information systems in the light of the experience of OECD member countries. Because information systems perform a descriptive, cognitive, or normative function in decision making and planning, they should be assessed not only in technical terms but also in terms of their contribution to national and local governments. In particular, information systems must be designed with the following issues in mind: service to the public; information and participation of the public; vulnerability of information systems; privacy protection; impacts on the personnel of local government; training needs; impacts on local government organization; cost-benefit analysis of their introduction and development; and national government role in stimulating and coordinating the development of information systems in local government. The development of data bases from administrative files and from monitoring and survey data encounters financial and administrative constraints. However, Averous suggests that the most difficult problem is to have better data rather than more data, and its solution may benefit from technological developments.

Itoko Suzuki (Chapter 4) presents a summary of the proceedings of the United Nations Expert Working Group on Modern Management and Information Systems for Public Administration in Developing Countries which was held on 12-16 December 1983. Besides financial, technical, and human resource difficulties, misutilization and gross underutilization of public administration information systems are observed in many developing countries. There is a gap between the current state of the art of public administration information systems and their actual utilization. The major issues in the application of information systems to local and regional administration are as follows: Policy issues (e.g., the need for a central focal institution or central guidance agency for formulating and implementing government policies on information systems; goals and priorities for information systems development; assessment of existing information systems and computer resources; decentralization of information systems; consistent methodologies for systems planning, design, and implementation; sharing information systems and data; national policy guidelines on employment and working conditions; and data privacy or protection); and Managerial issues (e.g., functional analysis and design of information systems; staffing; methodology for systems development; selection of hardware and software; costs and benefits of systems development; and education and training). Information systems guidelines and areas of international technical cooperation to implement these guidelines in developing countries are recommended.

David Moskovitz and David Mammen (Chapter 5) discuss the research findings at the Institute of Public Administration, New York on the use of information technologies for a wide range of applications, including urban and regional planning. The research suggests that the ability of governments to develop and implement information systems for urban and regional planning will require coping with a number of trends in the marketplace and technology which are presenting new problems and challenges. These trends include decentralization of computing power, the convergence of telecommunications and data processing systems, and increased opportunities to integrate different technological systems. While the research is U.S.-based, the trends and issues the authors have revealed are relevant to the experience in developing countries as well.

As the use of information technologies is becoming increasingly decentralized, the lack of quality control, technical competence, and system compatibility is becoming increasingly apparent. This does not, however, fundamentally affect the worth of microcomputers and decentralized data processing (e.g., the opportunity given to users to make decisions about the procurement, development, and use of information technologies, as well as to share and exchange information).

The important questions in the convergence of telecommunications and data processing technologies are the following: What telephone systems should governments buy or lease? Should governments purchase their existing phone systems? How can governments assure that residents and businesses in their jurisdiction have sufficient lines for both voice and data transmission? What opportunities do cellular (mobile) telephones and new computerized two-way radio systems offer for remote management and administration?

The benefits of system integration are increasing. By integrating different systems and technologies, government agencies will be able to have access to computerized information, as well as share information, programmes, and technical expertise. However, the need for system compatibility, standard definition of data, and common formats to store information is a serious problem. As Moskovitz and Mammen suggest, it is necessary that governments recognize the linkages between different systems and develop strategies to cope with the organizational and human resource issues.

Organizational issues relate to the assignment of responsibility and authority for controlling the procurement, allocation, development, and application of information technologies within government. Human resource issues include recruiting and keeping qualified employees, providing training, using consultants, telecommuting, dealing with displacement issues, and overcoming the fear of change or resistance to change, so that the new technologies are allowed to succeed.

Ian Masser (Chapter 6) reviews the literature on monitoring and evaluation in the light of certain perspectives on urban planning practice: (a) handbooks and sourcebooks that set out general guidelines for the establishment of monitoring and evaluation activities; (b) reports resulting from the comparative evaluation of experience in the monitoring and evaluation field; and (c) case study material that provides in-depth illustrations of particular aspects of the monitoring and evaluation process. He examines three main aspects of monitoring and evaluation: (a) the managerial aspects relating to the policy framework within which monitoring and evaluation operate; (b) the technical issues relating to the different activities that are involved in the process of monitoring and evaluation; and (c) the institutional structures and staffing policies needed to develop effective monitoring and evaluation systems. Because of the relative emphasis that must be placed on the technical aspects and the variety of tasks that must be carried out within the monitoring process, Masser makes a further distinction between these activities: (a) problem definition whereby goals and objectives are translated into operational terms; (b) data collection involving a wide range of procedures for gathering different kinds of information; (c) information management concerned with the processing and routine analysis of information; and (d) reporting procedures for presenting the findings of monitoring and evaluation activities to decision makers and other interested parties, respectively. Masser points out that the information technology exists already but the capacity to put this technology to effective use in local and regional planning has still to be developed.

There are general principles to which monitoring and evaluation activities have to conform. Masser provides illustrative examples of these principles drawn from the British and Dutch planning practice. Some of the general principles are the following:

1. Monitoring and evaluation systems must be strictly decision oriented and must satisfy the requirements of relevance and timeliness;

2. There is a need for the objectives of monitoring to be defined clearly and unambiguously;

3. Performance indicators should be specified that enable comparisons to be made between observed and expected values;

4. The scope of data collection activities depends on the extent to which the goals and objectives of the exercise can be expressed in operational terms;

5. Information management systems need to be developed which can satisfy both the objectives of data set reduction (or data processing) and provide facilities for the storage and retrieval of large data sets;

6. Reports on the findings of monitoring and evaluation consist of issues reports for internal use and general position statements for external use; and

7. There is no one best organizational structure for monitoring and evaluation.

Larry Reich (Chapter 7) describes the capital programming procedure in Baltimore City. Programming consists in formulating a six-year programme (i.e., arranging proposed projects in a time schedule for construction according to an order of priorities assigned them) and managing and monitoring the capital projects. Baltimore City has taken what is the most important step in the programming process, by establishing an on-line real time capital programming system and a capital project monitoring system (consisting of a project data display system and a project scheduling and tracking system).

Marvin Manheim and Joseph L. Schofer (Chapter 8) note that historically, information systems technologies and urban transportation planning have evolved in a parallel fashion. During the 1970s urban transportation planning moved from long-range framework planning to shorter-term planning concerned with the delivery of good transportation services. Related to this increased focus on short-term planning was the need to modify the data files and the programmes and models so that they could be used for a broader range of analyses, under a wider range of conditions. Information systems capabilities had to be evolved to support an environment of "responsive analysis," or to respond to the emerging model of urban transportation planning.

Presently available technologies support three major urban transportation planning information systems functions: (a) data acquisition (i.e., the use of sampling and survey methods for small-scale surveys, the use of geocoding systems, and field data collection using hand-held devices with microcomputer technologies); (b) maintenance (i.e., the periodic updating and revision of data by the use of random digit dialing and advanced telephone interviewing techniques, supplemented by "on-the-ground" checks to validate samples); and (c) information delivery systems (i.e., the use of microcomputers and software designed to support end-user computing, and the ability to package information products in a variety of ways).

In order to be more effective, Manheim and Schofer recommend that urban transportation information systems should be seen as a catalyst to the creation of a multiproduct, multiclient information service, called the Urban Transportation Information Systems Utility (UTISU). The UTISU has the following features:

1. Variety of clients (e.g., transportation agencies and firms, other public agencies such as planning and operating agencies in other functional areas and general-purpose units of government, and private firms and organizations).

2. User participation (e.g., clients contribute data, have access to data, or undertake data analysis and forecasting through cooperative agreements).

3. Information delivery means: (a) media for delivery of data (e.g., hard copy, computer-generated, or manually generated from computer-based data; on-line access to data stored in computers; machine-readable media; software packages and "turnkey" systems; and presentation media); and (b) other services (e.g., inquiry services, special surveys, training in the use and interpretation of data, training in the use of software, hardware, and other support tools, hosting of multiagency task forces producing or editing data, and educational series).

4. Variety of information sources (e.g., major cross-sectional data collection activities such as initial survey and periodic updates, and periodic or continuing data collection by transportation operating agencies, other public general-purpose or functional agencies, and private firms and organizations).

5. Frequent, results-oriented data updates (e.g., through small-scale sampling and monitoring techniques and special surveys to provide data needed to address a policy or planning question and to update the regional data base and/or forecasts).

6. Variety of financing mechanisms (e.g., public finance for information services, self-supporting services, and various mixed financing schemes and pricing policies).

7. Market-oriented management approach: (a) an identification of clients' needs for data; (b) market and product planning and strategies; (c) design of service offerings; (d) production of service offerings, including data collection, processing, and analysis, preparation of reports and files, and staff development and training; and (e) actual service offerings to clients.

ASIAN AND PACIFIC PERSPECTIVES

The authors of the four Asian case studies investigate the feasibility or practice of integrating information systems into urban and regional planning. There are, of course, differences between the countries in terms of the stage of development of information systems. The Kelang Valley Planning Secretariat in Malaysia already has begun implementing computer information systems for regional planning, while the Metropolitan Manila Commission in the Philippines is in the process of moving from manual to computer information systems. Seoul and Bangkok are enthusiastic about establishing information systems for urban and regional planning, but improvements in the existing data management system are needed before the planning organizations can incorporate computerization into their operations.

Johari bin Mat (Chapter 9) draws attention to the organizational factors in designing and implementing information systems (e.g., planning needs and priorities, national and local government support, and commitment of organizational resources), and in particular made a personal appraisal of the Kelang Valley Planning Secretariat's experience in introducing a data bank and urban information system. The Kelang Valley Information System (KEVIS) is an ongoing project, created in 1983 by the Prime Minister's Department to facilitate regional planning, monitoring, and coordination in the region. KEVIS is shown by the case study to be an important emerging aid in providing and coordinating data and information for urban and regional planning. Between 1983 and 1986 a three-phase implementation strategy is planned to be undertaken. For immediate implementation in 1983 were the Land Data System, Computer Aided Mapping System, and Statistical Information System. Phased for implementation in early 1984 was the Project Monitoring System, and later in 1985-86 the Property Information System will be attempted.

The Kelang Valley Planning Secretariat's initial experience with KEVIS has revealed the following problems: (a) the need to clean up, standardize, and update the data to make them useful for planning purposes; (b) the tendency to lose systems personnel (e.g., systems analysts, engineers, and programmers) to the private sector which offers more attractive job opportunities; and (c) the need for top management as well as all government personnel to understand the process and use of computers. In addition, some data gaps were acknowledged by Johari (e.g., lack of time-series or historical trend data and lack of detailed data to support local or subregional planning).

Elena M. Panganiban (Chapter 10) reports the emergence of two types of information systems for planning in the Metropolitan Manila Commission (MMC), a geopolitical entity responsible for development and planning in the Philippines' premiere region. One is the organized, comprehensive system, as illustrated by the planning processes for the Regional Development Framework Plan, 1983-92 and the Capital Investment Folio for 1983-87; and the other is the *ad hoc* fragmented system, as manifested in project planning of the different operation centres of the Metropolitan Manila Commission (e.g., the Solid Waste Improvement Programme, the Urban Transport Terminals Study for Metropolitan Manila, and the Metropolitan Manila Urban Transport Improvement Project). According to Panganiban, the fluidity of organization at the MMC and the data base deficiencies which are mainly due to the MMC's reliance on secondary sources, underscore the need for a centralized planning information system within the MMC. Indeed, the secondary sources do not provide the same kinds, quality, and quantity of data. Hence, the information on which the RDFP is based is inadequate and there is some concern about the Plan's utility as a source of data for local governments. Lack of data in a disaggregated form is seen as a particular constraint placed upon local governments in preparing a profile analysis for their local development plans. Other data problems cited by Panganiban relate to the lack of detailed physiographic information, serious gaps in data, analysis, and inferences on socioeconomic conditions (e.g., lack of up-to-date employment data and of unemployment data), minimal economic projections and proposals, absence of projections on future transport demand, very little data on solid waste management, and lack of cadastral and barrier maps and aerial photographis for land use planning and zoning. Another problem highlighted by the case study concerns the lack of data integration for programme planning and the delivery of integrated services. The data generated by the operation centres and other offices in the MMC had not been integrated into an organized information system. At times, the data are not available and not accurate (e.g., data on solid waste collection and disposal, management, and budgeting practices), the information required is not centrally located (e.g., routing and collection of solid waste), and financial data are inadequate. The initial computerization of the Capital Investment Folio data is seen as a promising direction for future coordination of information activities at the MMC. Panganiban concludes that there is a clear need to establish order and system in the existing disarray in the data system before the MMC incorporates computerization into its operations.

An-Jae Kim (Chapter 11) identifies a number of information-related problems in development planning in Seoul Metropolitan Region, such as information use, data collection and management, project monitoring and evaluation, and organization of information systems. The problems in information use include: (a) imbalance between demand and supply of information; (b) inaccuracy and inconsistency of information; (c) lack of concrete information in terms of space, time, and item; (d) weak linkage between users and suppliers of information; and (e) restricted accessibility to information on environmental pollution, residents' income levels, and landownership. Because the local governments do not provide data on industrial production, employment, per capita and per household income, interregional flow of goods and services, and money flows, there is a shortage of regional economic information. The data supplied by various sources also differ (e.g., data on the economy, industry, income, employment, social structure, environment, land use, and land price).

Kim also discloses deficiencies in data collection and data management: (a) the data collection process is not well formalized and systematized; (b) collection methods are deficient in scientific methodology; (c) detailed and concrete data are not provided; (d) interinstitutional linkages in data treatment are weak; (e) data analysis techniques are not standardized; (f) the data distribution system is not effective and timely; (g) data management is inefficient and characterized by diseconomies.

There are also problems in project monitoring and evaluation in Seoul Metropolitan Region: (a) projects or programmes do not always accord with higher general plans; (b) project feasibility analysis is not fully undertaken; (c) monitoring and evaluation processes and methods are not well developed; and (d) there is a lack of knowledge of monitoring and evaluation capabilities displayed by personnel.

In Kim's view, Seoul Metropolitan Region has not devoted adequate attention to the training of personnel in data collection, statistical analysis, and information.

Kiat Chivakul (Chapter 12) notes the important role of urban planning in the rapidly changing urban environment in Thailand. The centralized system of administration has had a great impact on the Bangkok Metropolitan Administration (BMA) and its plan making and data organization and management. The BMA however lacks an organized information system for providing information to management and planners to support their tasks. Data availability (e.g., lack of consistency and standardization of data in terms of time, geographic area, or definition) is a serious problem in the BMA. Therefore, a restructured planning organization is needed to improve the organization and management of BMA's information system which is still in manual form (except for the Land Development Tax Project and *ad hoc*

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projects which use a computer system). The author recommends a framework for the organization of an urban information system which is patterned after that of the city of Calgary, Canada.

The concluding chapter highlights some of the conceptual, methodological, and empirical issues in designing information systems for urban and regional planning which were explored and discussed in the concept papers and country case studies in this volume.

NOTES

1/ An information system for urban and regional planning is defined as the process by which information required for plan formulation, implementation, monitoring and evaluation, is identified, collected, organized, processed, analysed, retrieved, and disseminated for urban and regional decision making and policymaking. Quantitative or statistical information represents the main element of the information system input, and is, therefore, the basis for planning information. Qualitative or secondary information (i.e., published and unpublished sources) supplements quantitative information. Visual materials (e.g., maps, air photographs, graphs, and tables) are also sources of information for planning.

2/ For a survey of literature on information systems for local and regional planning, see the "Research Proposal on Information Systems for Local and Regional Development" (UNCRD/RES/522/83) (Nagoya: United Nations Centre for Regional Development, 1983). A recent book (Peter Nijkamp and Piet Rietveld, eds., Information Systems for Integrated Regional Planning. Amsterdam: North-Holland, 1984) consists of studies in Europe and the United States initiated by the Integrated Regional and Urban Development Group at the International Institute for Applied Systems Analysis in Laxenburg, Austria and the Department of Regional Economics at the Free University in Amsterdam. The studies address key issues of information systems for planning regional development, by evaluating trends in the progress of information systems, by identifying the difficulties in their use for aiding long-term regional development, and by focusing attention on the possibilities of new operational tools in modern information systems.

3/ The United Nations Centre for Regional Development Research Project on Information Systems for Local and Regional Development aims to improve knowledge and understanding of the use and application of information systems in local and regional planning in developing countries.

In particular, it aims to examine the state of information systems for local and regional planning in developing countries to provide a cross-section of their conditions and problems. The project is especially concerned with establishing policy recommendations to improve the quality and usefulness of data and information on local and regional development and to strengthen and improve information systems for local and regional planning in developing countries. Phase I focused on Asian metropolitan regions.

PART I

Conceptual and Theoretical Perspectives

Chapter 1

URBAN AND REGIONAL STATISTICS IN DEVELOPING COUNTRIES

Peter Nijkamp

GENERAL ISSUES OF INFORMATION SYSTEMS FOR URBAN AND REGIONAL PLANNING

Why Do Planners Need Information?

An entrepreneur who wants to introduce a new product on the market needs precise insight into the wishes of consumers, in order to be able to assess the expected sales of the new product. Given the expected revenues and costs of this product, he will decide whether or not to start the production of this new commodity.

In an analogous manner, a public decision agency will only support a certain plan if — after a deliberate judgement of all costs and benefits involved — it is worthwhile to undertake the endeavour. This does not only hold for national government planning, but also for regional and urban planning. Urban and regional planning (for instance, with regard to the housing situation, the labour market, the provision of facilities, and the design of infrastructure) needs information on the phenomena concerned, in order to avoid failures in policy decisions and to increase the efficiency of urban and regional policy.

In the past centuries, plans for urban and regional development were usually made in response to local conditions or exogenous events (e.g., floods and earthquakes), and not as part of a systematic and comprehensive long-term national-regional-urban policy. But in more recent decades many public policy agencies have deliberately tried to influence urban and regional patterns of activities and of living standards, in order to stimulate national economic efficiency and to reduce socioeconomic discrepancies between regions or cities. A well-known early example is the Tennessee Valley Authority, established in 1933 to control flooding, improve navigation, and generate electricity in the Tennessee River Valley of the southern United States. Quite extensive data banks and impact assessments have been designed to gauge the foreseeable consequences of various policy plans. Analogously, for the Bratsk-Ilimsk Territorial Production Complex in Eastern Siberia, erected in 1952 as a scheme to produce hydroelectric power and thereby exploit the mineral resources of the region, a great many regional statistics have been collected in order to provide analytical support to these regional development plans.

Many urban and regional planning authorities are nowadays provided with rather extensive data banks and urban-regional statistics. The spread of computer hardware and software has made it much easier for planning authorities to collect, process, and distribute information and to examine plans and projections, and so make their planning more effective. This era has become the era of information, and urban and regional planning may become one of the important users of information.

Clearly, many policy agencies tend to become very "data-hungry" in attempting to make their policy measures as effective as possible. A major problem in designing information systems for urban and regional planning is evidently to find a balance between completeness and manageability of statistics.

A related problem is whether the collection and production of urban and regional statistics should be centralized or decentralized. There is of course a strong tendency at a more disaggregate planning level to demand more detailed and heterogeneous data which can hardly be provided by central statistical offices, as such offices usually base their data collection and production on fairly global and uniform criteria without too much regard of specific local needs.

An illustrative example is provided by Italy, a country marked by substantial discrepancies between the southern part (the Mezzogiorno) and the central and northern part. Most regional and urban data are collected by local authorities but they are published only at the national level by a central body.

In recent years, fortunately, much attention has been given to decentralization in public policy, which has led to an increase in claims put on local and regional statistics. In the developing countries too, where resources for detailed information systems are scarce, there is an increasing awareness among planners that the usefulness of economic data in policymaking and planning can be increased if sufficient thought is given to the local and regional dimensions of statistics.

Finally, in addition to the level of regional detail of statistics, there is also increasing attention for a timely release of data in order to make them more appropriate for effective planning (especially in the case of procedural planning modes, including feedbacks). In this regard, automated information systems may be of much value for efficient and effective policymaking at the urban and regional levels.

Data and Information

As mentioned before, regional and urban planning and policy analysis aim at reducing uncertainties regarding knowledge of (or choices about) future spatial developments. Monitoring, forecasting, and scenario analysis are some of the current powerful tools that serve to deal explicitly with uncertain but foreseeable events in the near or distant future. In this regard, statistics and information systems have always drawn a great deal of attention in planning and policy analysis.1/

Usually, a distinction is made between data and information. Data are numerical representations or other symbolic surrogates aimed at characterizing attributes of phenomena, while information may be regarded as structured data (for instance, by means of modelling, organizing, or converting data), so as to improve insight into a certain phenomena.2/

The complexity of modern societies and the enormous social costs involved in taking wrong decisions have led to a general need for appropriate information, not only at the level of individual or private decision making but also in public policymaking and planning.3/ The data storage capacity of modern computers favours also a much more structured use of information than in previous periods. Not only in the developed world, but also in developing countries, proper and systematic information is regarded as a prerequisite for successful planning.4/

Clearly, there are many trade-offs involved in collecting data and developing information systems. The accuracy, adaptability, and timely availability of data have to be traded off against the economic consequences in terms of costs and benefits. A necessary condition for a manageable information system is a permanent user-surveyor dialogue so as to guarantee a meaningful coordination of the various tasks in the planning process.

Another problem may emerge from a misunderstanding of the nature of statistics: It is often assumed that information systems have mainly a cost nature. In that case, the increase in the level of knowledge would only have to be traded off against the costs of information systems. This is, however, only a partial view on information systems, as the "without" situation is not considered: Information systems may also have any other benefits, as they may lead to avoiding the costs of taking wrong decisions. Thus, the value of an information system cannot be properly judged without taking into account and evaluating the costs and benefits of all relevant courses of action.

Braybrooke and Lindblom have investigated the relationship between the necessary information level (or level of insight) and the impact (or depth) of a certain decision or choice.5/ This relationship may be represented by means of figure 1.

Hence, a fundamental issue in dealing with statistics and information systems is a trade-off between the costs of producing relevant information from appropriate data and the benefits of employing this information in actual planning procedures or policy choices.

Data can be collected at various levels and from various viewpoints. Ideally, the kind of necessary data is determined by the aims of the analysis (e.g., impact analysis and plan evaluation), but in reality, one very often has to use an existing and given data base in the most efficient way so as to extract the most relevant information from this data for a prespecified use in a planning context. For instance, it appeared from the international survey of multiregional economic models (carried out by the Integrated Regional and Urban Development Group of the International Institute for Applied Systems Analysis),6/ that the majority of multiregional economic models did not produce their own specific data base, but mainly employed the existing data provided by the various statistical (regional and national) offices.

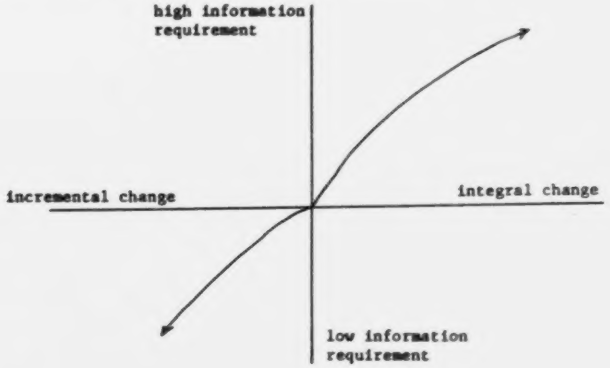


Figure 1. Necessary information and impact of a decision

The collection of data for urban and regional planning is a problem in itself. Normally, data are collected from a multipurpose point of view, so that it is usually very difficult to obtain specific data with a precise and distinct focus on the problem at hand. Very often, data have to be manipulated, (dis)aggregated, or adjusted, in order to let them fit into a precisely demarcated research or planning problem. Data can be collected at various levels of aggregation, for instance, at individual levels (e.g., individual household income) or at aggregate levels (e.g., average regional income). Such data may be the result of interviews, questionnaires, censuses, samples, surveys, or nonsurvey techniques. The choice for a specific data collection technique and for the level of aggregation of this data will be determined by the aim of the information system and will also depend on the above-mentioned trade-off between costs and expected usefulness. The loss of information due to an aggregate representation of disaggregate variables can be represented by the entropy measure: Entropy measures the ignorance of microvariables when one knows only a macroscopic variable.7/

A basic problem in urban and regional planning is that one is usually not only interested in measures describing the state of a system, but also its evolution. Up-to-date data for complex systems (e.g., based on monitoring systems), however, are normally hard to obtain because of the high costs of a permanent filing system for relevant data. Sometimes interpolation or extrapolation techniques are used to cope with the lack of data for a time series.

The treatment of data (e.g., restructuring and interpreting) may be based on various viewpoints and approaches.8/ Examples of related operations are:

capturing : a systematic recording of data

verifying : validating the correct nature of data

classifying : categorizing data into specific classes

arranging : placing data in a predetermined sequence

summarizing : aggregating data into new sets

calculating : manipulating data in an arithmetic way

forecasting : extrapolating data toward the future

simulating : assessing and manipulating lacking data storing : placing data onto storage media

retrieving : selecting specific data from specific media

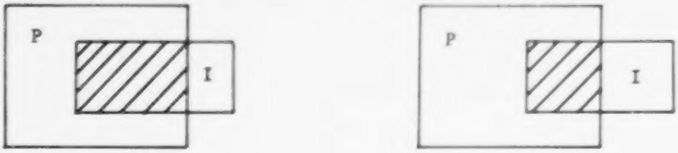
communicating : transferring data to other users

All these operations are determined by the aims of the information system at hand. The choice for certain operations very much depends on the related costs, caused *inter alia* by the personnel requirement, modularity, flexibility, and versatility of the system concerned, and the processing speed and control.

The benefits of an information system depend *inter alia* on its accessibility, comprehensiveness, accuracy, appropriateness, timeliness, clarity, flexibility, verifiability, freedom from bias, and quantifiability.

Clearly, a system with redundant information may lead to inefficient decisions, while lack of information may also lead to less than optimal decisions. Theoretically, an optimum level of information will be reached, if the marginal value of information equals its marginal cost. In reality, these costs and benefits can hardly be expressed into one common denominator, so that this marginality rule has only a limited practical relevance. The various aspects involved in judging the value of an information system normally require a multidimensional trade-off.

A planning-oriented and future-oriented view of information systems may reveal a discrepancy between the field of interest covered in planning and the focus of a given information system. Especially in the case of long-term planning problems, this discrepancy may be significant (see figure 2). Information systems play a role in planning, but usually the actual contents of an information system does not cover the long-run issues in a planning context. Contemporary planning issues, such as energy scarcity and innovation, are hardly included in any information system and demonstrate clearly the lack of future orientation of current information systems. Such questions once more illustrate that information systems should not start off from current interests, but should also try to encompass new components that are not yet receiving much attention, but may potentially become crucial issues in the future. Examples are: effects of international pollution, conflicting behaviour between different public agencies, regional dimensions of multinational companies, impacts of an industrial reorientation, spatial aspects of the growing importance of agriculture, and spatial consequences of microelectronics.



a. short-term b. long-term

Figure 2. Overlap of planning fields (P) and information systems (I)

Wilbanks and Lee mention five bottlenecks precluding a direct and smooth application of information from scientific analysis in policymaking:9/

(a) the lack of tailor-made scientific tools for various policy issues, given the time constraints prevailing in policymaking.

(b) the discrepancy between basic scientific research and the needs of planners and politicians.

(c) the existence of gaps in knowledge (for instance, interaction effects across disciplinary boundaries, institutional uncertainties, and unforeseeable events).

(d) the lack of integration in scientific research, leading to a production of piece-wise kinds of information.

(e) the lack of learning from experiences (especially failures) from the past.

Use of Information

Information as structured data systems can be used in three stages of a planning process, viz., description, impact analysis, and evaluation.

Description

A description means a structured representation of the data regarding a system. For instance, the social indicator movement may be regarded as an attempt at representing relevant features of a social system in a systematic way. The same holds true for environmental quality analysis.

In general, it is meaningful to represent the main characteristics of a system by means of multidimensional profiles.10/ Each of these profiles comprises a set of relevant indicators. For instance, a regional system may be characterized by means of the following profiles:

economic : production
investments
labour market
consumption
etc.

housing : quantity of dwellings
quality of dwellings
residential climate
prices and rents
etc.

infrastructure : accessibility (public and private transport)
distance
mobility (migration, recreation)
etc.

finances : taxes
subsidies
public expenditures
distributional aspects
etc.

facilities : health care
cultural
social
recreational
etc.

environmental : air pollution
noise
sewage systems
congestion
segregation
density
etc.

energy : energy consumption
insulation of dwellings
central urban heating system
tariff system
etc.

Depending on the aim of a specific descriptive analysis, a choice among the foregoing profiles (including their levels of measurement) has to be made in order to get an integrated view of the system at hand. Thus, such a descriptive view implies a transformation of data into structured information classes.

Such profiles with detailed elements are not only relevant in regional economics, but also in many other disciplines, such as environmental science, geography, and demography. In all these disciplines, there is a basic need for the systematic storage and treatment of relevant data.11/

Impact Analysis

In the last decade, several types of impact analysis for planning and policy purposes have been developed: Environmental impact analysis, social impact analysis, urban impact analysis, input-output analysis, technological impact analysis, energy impact analysis, and so on. The main aim of impact analysis is to get a more complete, systematic, and comprehensive information on the effects of public policy decisions or of exogenous shifts in the parameters or data of a system. Impact analysis is a method for assessing the foreseeable and expected consequences of a change in one or more exogenous stimuli that exert effects on the element of the profiles characterizing a system.12/ In general, impact analysis implies a transformation of first-order information into new information categories.

The need for impact analysis stems from various sources:

(a) a systematic investigation of consequences of public policy may lead to a more justified policy decision;

(b) an integrated impact analysis may avoid neglect of (potentially important) indirect or unintended effects;

(c) the presence of spillover effects and interactions between several compartments of a system requires a comprehensive view of its complicated mechanism; and

(d) the hierarchical structure of many planning systems evokes the need for a multilevel impact analysis which is able to trace all relevant consequences at various levels.

Due to the pluriformity and complexity of Western industrialized countries, coherent and balanced public policy strategies are usually fraught with difficulties. For instance, the integration and coordination of various aspects of physical-economic planning problems (such as public facilities, communication and infrastructure networks, residential housing programmes, and industrialization programmes) is often hampered due to administrative frictions, monodisciplinary approaches, lack of information, and political discrepancies.

Impact analysis may be a meaningful tool for more integrated and coordinated planning strategies; as such, an analysis describes systematically the effects of changes in control variables on all other components of a system. Consequently, impact analysis should pay attention to the variety, coherence, and institutional framework of the system at hand. This implies that economic, spatial, social, and environmental variables should be included as relevant components of the system. Preferably, impact analysis should be based on a formal model.13/

Evaluation

Evaluation refers to the process of analysing plans, proposals, or projects with a view to searching out their comparative advantages, and the act of setting down the findings of such an analysis in a logical framework. Thus, the essence of evaluation in a planning context is the assessment of the comparative merits of different courses of action, so as to assist the process of decision making.14/ The necessary steps prior to the evaluation process itself are the descriptive analysis and the impact analysis set out above. Evaluation implies essentially a confrontation of structured information categories with policy and planning views.

Evaluation may take various forms: Social cost-benefit analysis, cost-effectiveness analysis, planning balance sheet analysis, multiple criteria analysis, linear programming analysis, multiobjective programming analysis, and so forth. Especially during the 1970s, a whole spectrum of operational evaluation methods were developed to assess the pros and cons of the effects of various courses of action.15/

Evaluation requires the definition of a set of operational judgement criteria (e.g., efficiency, equity, and environmental criteria), a set of alternative actions or strategies (including information on their technical and economic feasibility), a set of (implicit or explicit) preference parameters reflecting the relative importance attached to certain outcomes of a given action or strategy. Sometimes scenario analysis is used as a way of dealing with hypothetical reasonable policy preference patterns.

It should also be noted that planning has essentially a process character, so that during each stage the necessary and relevant information has to be provided. In order to make full use of information in evaluation and decision making, it is necessary to also indicate precisely the nature of the variables included (target variables, instruments, and exogenous data). In general, it is also useful to indicate precisely how a certain desired end-result should be reached (for instance, by means of the well-known golden-section and turnpike rules). In order to prevent decision makers from taking unfeasible courses of action, threshold and bottleneck analysis may provide information about the conditions under which a certain new state of the system might evolve.

The desires of actors in private or public agencies with regard to the quality of an information system will very much depend on the nature of the planning problem at hand. In general, one may assume that the claims on an information system will be higher as:16/

(a) the frequencies of these choice situations are lower;

(b) the range of impacts is larger;

(c) the number of spillover effects (distributional effects) to other systems is larger;

(d) the number of conflicts involved is larger;

(e) the financial implications are more substantial;

(f) the time horizon of impacts is longer;

(g) the number of decision agencies or actors is larger; and

(h) the outcomes of choices to be made are more uncertain.

The previous remarks can be illustrated by means of figure 3, which reflects the demands on information systems as a function of the abovementioned items. The envelope curve reflects the maximum demand, while the interior centre reflects a minimum demand (e.g., in the case of daily routine decisions).

The abovementioned remarks point out once more the existence of difficult trade-offs in policy analysis, decision support, and information provision. These trade-offs emerge from the multipurpose nature of an information system:

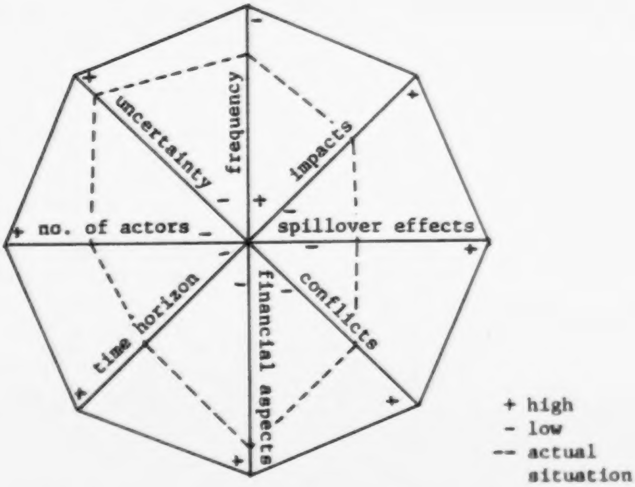

frequency
impacts
spillover effects
conflicts
financial aspects
time horizon
no. of actors
uncertainty
+ high
- low
-- actual situation

Figure 3. Diagram of demands on information systems caused by the nature of choice problems

(a) the aim of a maximum accuracy of the data input (time series, disaggregate survey data, longitudinal data, etc.).

(b) the aim of a maximum quality of the information system (efficiency, flexibility, coherence, etc.).

(c) the aim of a well-structured choice problem (coordination, conflict management, public participation, etc.).

These trade-offs can be illustrated by means of the 'flask model', in which three flasks are connected by means of glass tubes (see figure 4).

The three flasks are filled with water, while the three abovementioned conflicting issues (accuracy of data input, required quality of information system, and complexity of choice problem) are measured on the necks of these flasks. Any change in the water level in one of the flasks has an influence on the level in the remaining flasks, so that a certain trade-off between these conflicting issues is implied by this 'flask model'.

The given quantity of water in the flasks corresponds to the amount of efforts given to the three issues at hand. The precise trade-offs between these issues are represented by the shape and the size of each individual flask. In physical terms, a change in the water level in one of the flasks will require a certain external pressure on the water surface. Analogously, in policy terms, more emphasis on one of the three issues will lead to a relaxation of efforts to be made for the remaining issues. Combined actions (e.g., more emphasis on both better data and higher quality of information systems) are also possible in this framework. It is easily seen from figure 4, that a low accuracy of data will either demand a high quality of the information system or lead to a less organized choice situation.

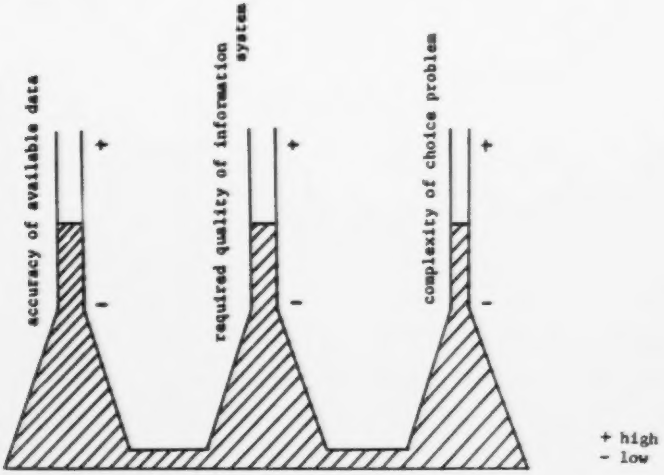

accuracy of available data
required quality of information system
complexity of choice problem
+
-
+
-
+
-
+ high
- low

Figure 4. Trade-offs among three items in a choice problem

Information systems for regional planning often suffer from lack of reliable data. This has, of course, significant impacts on the reliability of results from (multi)regional planning models. It should be noted that often a less satisfactory specification or performance of regional models is ascribed to a weak data base. Though evidently, unreliable data may affect the quality of the results, it is at the same time also true that the structure and econometric aspects of many models presuppose a data base that does not fully exist in reality. In this regard, model users have to face and accept a situation of inappropriate information systems and of gaps in statistical data and to design models that are in closer harmony with the existing information.

In addition to accommodating for lacking data, the possibilities of incorporating qualitative data have to be mentioned. Too often, qualitative data are left out of consideration, although such data may contain substantial pieces of information. The recent developments in the area of qualitative (and fuzzy) spatial data analysis may be a meaningful way of employing all available relevant information as well as possible.17/ Categorical data analysis, generalized log-linear models, ordinal regression analysis, and path analysis (e.g., based on partial least squares) are a few examples of modern statistical/econometric tools that are capable of dealing with data measured on a nonmetric scale.

Statistics for Urban and Regional Planning

The abovementioned expositions on information systems were fairly general and did not have a distinct focus on a given problem area. Therefore, it may be worthwhile to delimit the scope of the present section by addressing problems of information systems in a regional development setting so as to pay more attention to the use of information systems in urban and regional planning.

It may be meaningful to specify some general judgement criteria for information systems in urban and regional planning. In an ideal situation, the following aspects might be mentioned:

availability of information : the relevant information should be available during the successive stages of the planning process so as to guarantee an adequate picture of the system at hand (including possibly longitudinal data);

actuality of information : the information should be based on recent data in order to provide a representative and up-to-date picture of a complex reality;

accessibility : the information should be accessible to both model builders and users (including policymakers and planners);

consistency : the information should represent a set of coherent and noncontradictory data on regional processes and patterns;

completeness : the information should take into account all (intended and unintended) effects and implications of policies upon the system at hand;

relevance : the information produced should be in agreement with the aims of regional (or urban) management and planning;

pluriformity : the variables included in an information system should reflect the variety and multidimensionality of a multiregional system;

comparability : the various data included in an information system should allow a comparison with other data measured at different time periods or in different areas;

flexibility : the information system should provide comprehensive information which can be adjusted to the needs of users or to new circumstances;

measurability : the information system should take into account the available data measured on any meaningful scale (including qualitative information);

comprehensiveness : the various components of an information system should provide an integrated picture of a multiregional system;

effectiveness : the information produced should allow a confrontation with a priori set policy targets, so that the effectiveness of policy measures can be gauged;

versatility : the information provided may also be used for other planning purposes;

validity : the reliability of the information provided and of the related statistical inferences should allow a judgement from a statistical or econometric point of view.

In addition to these general methodological criteria, some specific regional or multiregional elements of an urban and regional information system can be mentioned.18/

integration : the information system should attempt to present relevant data for each relevant spatial level and each relevant spatial unit, so as to guarantee both comparability of data from one region to another and coordination of various planning activities in different agencies;

interregional interaction : an urban and regional information system should reflect the interwovenness of a spatial system by demonstrating the volumes of interregional commodity flows, migration flows, capital flows, etc.;

specific regional bottlenecks : an information system should also indicate whether or why important regional information is lacking (for instance, the frequent lack of insight into monetary flows between regions);

multiregional decision making : various decisions affecting a regional economy are made at the headquarters of corporate decision making entities; in addition, flows of income and profits are hard to attribute to a specific region. An urban and regional information system should try to disentangle the complexity of such a spatial system;

standardization : in order to make data comparable across regions, data has to be standardized (for instance, by relating them to the population size of the area). An information system should provide a sound basis for such a standardization and should also indicate the sensitivity of the results for a specific standardization (depending _inter alia_ on the social and demographic structure).

A well-known problem inherent in any kind of urban and regional information system is the spatial demarcation of the system concerned (in terms of cities, regions, etc.). From an analytical point of view, the spatial demarcation might be based on functional linkages between the spatial entities of the system at hand, although data availability very often hampers the application of this standpoint. From a planning point of view, the spatial demarcations might be based on the existing administrative framework, although data problems may emerge.19/ This problem deserves much attention in a mature analysis of an urban and regional information system.

Frequently, information systems for regional and urban planning have been developed in close connexion with multiregional models. Multiregional models -- as an extension of traditional econometric modelling -- aim at providing consistent and coherent information on a complex spatial world, so as to identify the main driving forces and the mechanism of a complicated multiregional system.20/ The aim of coherence and consistency will, in general, lead to a rejection of economic models that do not take into account the openness of a region. Thus, without a consideration of interregional and national-regional links, there is no consistency guarantee for the spatial system as a whole. Usually, there are various kinds of direct and indirect cross-regional linkages caused by spatiotemporal feedback and contiguity effects, so that regional and urban developments may also exert significant impacts on a spatial system; this is especially important because such development may affect the competitive power of regions in a spatial system. For instance, a general national innovation policy may favour especially the areas with bigger agglomerations. The diversity in an open spatial economic system requires coordination of planning activities at the national and regional level, leading to the necessity of using multiregional economic models in attempts to include regional profiles in national-regional development planning. This problem is also an important issue in future investigations.

Another important problem is related to information loss by aggregating a system from a micro level to a meso or macro level, as information loss may occur in each of the three abovementioned stages : data input, models, and final profiles. Similar problems may emerge in attempts to disaggregate existing data into data of a lower spatial level. Such questions of consistent bottom-up aggregation or top-down disaggregation should also be addressed in further research in information systems.

Finally, the related problem of multilevel (or hierarchical) approaches may be addressed in information systems, not only from an institutional point of view but also from an analytical point of view.21/

As mentioned before, the key question of building up an information system is the search for a compromise between various conflicting criteria. At present, the existing systems of information (statistics and specialized operative systems) are incomplete, inconsistent, and insufficiently oriented toward the needs of the analysis of geographical aspects of socioeconomic development planning. This situation leads to a lack of data for models, gaps in adequate use of information for the decision making process, and difficulties faced by users in making consistent decisions and in implementing models. Hence, the obvious problem is: How to fulfill the needs of information for planning integrated regional-national developments.

The development of computerized information systems supporting regional and national planning and management, has in recent years been marked by much progress and has led to a variety of meaningful experiences, the accumulation of which could greatly contribute to the solution of the above problems. Therefore, a major aim in designing operational decision-aid systems is to develop a systematic framework for an urban and regional information system in specific geographical, socioeconomic, and institutional settings. Such a framework is also important for the current practice of urban and regional planning, for the design of appropriate models, for the treatment of imprecise data, and for the development of suitable evaluation models.

Finally, some explicit attention has to be given to spatial referencing of statistical data. As already indicated, statistical data that are made available to the regional planner are often somewhat inapposite because they have been arranged to describe economic variables at the national level or for specific industrial sectors. Another problem that the planner may encounter is that discrepancies between administrative and socioeconomic areas can lead to lack of agreement between the spatial scale on which the information is based and the scale appropriate to the planning problem. It may also prove difficult to combine spatially oriented information systems that have been set up independently.

In fact, spatial referencing of regional information did not receive proper attention until the late 1970s, but since then many techniques and software packages have been designed for managing and analysing geographic data. One particular application of computerized map-making techniques, called geocoding, has made it easier to adapt information systems to the needs of urban and regional planners. By this method, information on all intersections of the national transport infrastructure can be digitized so that a corresponding network of nodes, connected by segments, is defined.

Geocoding has been used for INSYRON, the information system of the National Physical Planning Agency in the Netherlands. INSYRON integrates land use classification, information on housing, and public utility access points, and also includes information on traffic flow and other activities. Because the side of a street can be represented by one geocoded segment, encoding of all segments allows the planner to look into the distribution of shops, for example, or the relative positions of public facilities. The advantage of storing data at this level of detail is that it offers flexibility: Data can be aggregated to different scales according to the planner's requirements. The availability of a coherent data set also means that different government agencies in the Netherlands now use basic data more consistently.

The aggregated spatial data of the Dutch system are stored in regional data bases that are maintained by regional authorities. Dutch planners claim that decentralization results in greater efficiency of information flow and is cheaper than a centralized information system, which would normally have to be much bigger and more complex in order to hold data on the geographic locations of physical objects, and would thus cost more in terms of storage capacity and computer processing time.

In conclusion, spatial referencing of data may be extremely important for an effective detailed planning strategy, but it requires much attention to coordination and costs involved.

An International Comparison of Spatial Planning and Information Systems

Regional and urban planning and information systems exhibit a wide variety across various countries, depending on historical, institutional, and political factors. In the framework of a study carried out under the auspices of the International Institute for Applied Systems Analysis, a cross-national in-depth comparison of elements and contents of spatial information systems in six different countries has been undertaken, viz., Sweden, France, U.S.A., the Netherlands, Czechoslovakia, and Finland.

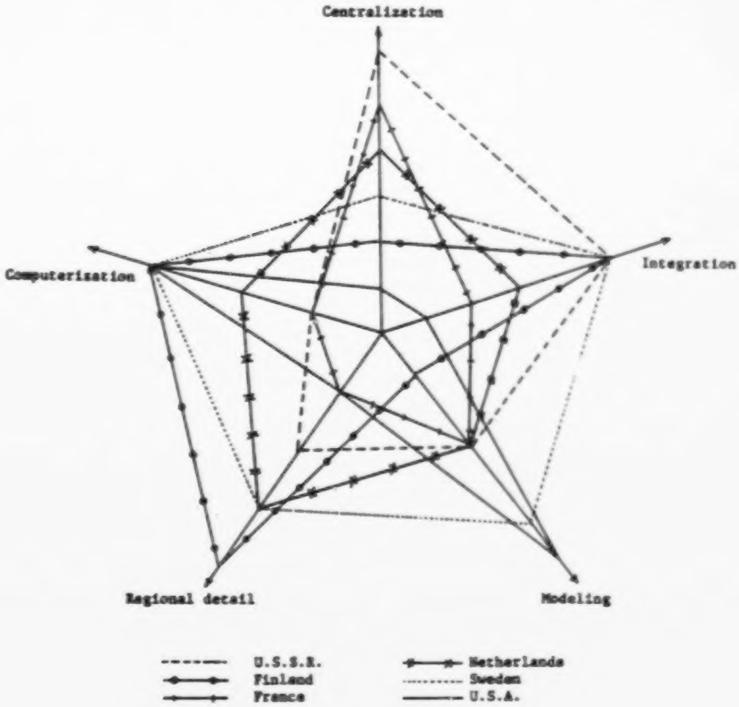
Clearly, such cross-comparisons are fraught with difficulties due to differences among countries. The present cross-comparisons have been based on national reports on spatial information systems for the country at hand, written by an expert in this field.22/

All these national reports have been written according to a common standard framework, so that at least a common scope and structure of the cross-national comparisons is guaranteed. Each expert from the country concerned had to provide detailed information on various planning components, linkages between these components, degree of centralization, specific information systems for each planning component, and so forth. The following components were included in the national reports: housing, transportation, commuting, migration, labour market, environment, and land use.

The regional information systems in the six countries were compared in terms of five main attributes. Because of the small number of countries involved and the large number of variables affecting the different features of these systems, the results could only be tentative, and have been expressed as ordinal rankings. Figure 5 shows the results of the comparison of the information systems.23/

The degree of centralization of information systems seems to be lowest in the U.S.A., where most states have developed their own regional economic models. In contrast, regional initiatives for building information systems appear to be small in France and Czechoslovakia. In the other countries, some steps have been taken toward decentralization. The extent of decentralization in each country certainly seems to reflect the level of decentralization of the planning systems.

Figure 5. A "spider web" with attributes of spatial information systems



The degree of integration refers to the production of synchronized and standardized information on the various planning components (such as housing and transportation) at each planning level. Of special interest are Finland and Sweden, whose information systems are based to a large extent on administrative register systems, which can be linked by means of codes that identify all statistical units, such as persons.

The ranking of the countries by this attribute corresponds roughly to the order found for the degree of horizontal coordination of different planning components at each planning level. For example, both the planning and the information systems at the regional level appear to be well integrated in Czechoslovakia, whereas those in the U.S.A. are rather fragmented.

The role of modelling in helping regional forecasts or production of impact statements is strongest in the U.S.A. and Sweden, but very modest in Finland. The majority of operational (multi)regional models has not been subjected to rigorous validation tests. In addition, there appears to be a serious lack of models for ex post evaluation of policy performance. This would indicate that regional planners are generally not paying enough attention to lessons that can be learned from the past.

The degree of regional detail that is appropriate depends on the particular planning component as well as the spatial level. For instance, high detail is necessary for local economic and industrial planning. In Finland, regional detail is generally very high, and data are available at the local or country level. In Sweden and the Netherlands, county or provincial data are available, and in France and the U.S.A. the average size (by population) of the corresponding region is even greater. It appears that the larger the population, the lower the degree of regional detail. All six countries have problems with confidentiality of information.

The extent of computerization of regional information systems has increased rapidly in the last two decades. This is most evident in data storage and processing, and less so for data input and output, though Finland, Sweden, and the U.S.A. have on-line connexions to their administrative data bases for the major users. The ranking of the countries is the same as that for the role of modelling, with the exception of Finland, which indicates that progress in one does not necessarily imply advances in the other. In view of the high demands imposed by regional planning systems in some countries, computerization and modelling appear to be underdeveloped in information systems at the regional level.

SPECIFIC ISSUES OF STATISTICS FOR URBAN AND REGIONAL PLANNING IN DEVELOPING COUNTRIES

The Necessity of Information Systems for Urban and Regional Planning in Developing Countries

Urban and regional planning -- in both the developed and the developing world -- has no self-regulating mechanism that guarantees an integrated approach to social, economic, environmental, and physical development programming. The coordination of different policies at the local, regional, or national level is a major challenge to and responsibility of governments in all parts of the world. In addition to institutional problems, however, analytical problems of integrating policy fields do exist. This latter category has to be coped with in a scientifically justified manner by planners and scholars.24/

It is clear that a unifying conceptual and operational framework for integrated policy analysis in less developed areas, taking into account the varying direct and indirect roles of governments, requires a rigorous endeavour to structure development programming in a systematic and coherent manner. Housing, migration, and urban renewal policies will never be effective, if a more comprehensive view of a complex spatial reality (and of policy thereon) is lacking.25/ Consequently, appropriate statistics at the urban and regional level are necessary.

The rapid spatial changes during the last decade (e.g., desurbanization, locational changes due to new technologies, and drastic shifts in geographical mobility patterns) have evoked the need for a more systematic analysis of spatial development patterns so as to provide more insight into the effects of various public policies.26/ Many analyses have demonstrated that the geographical pattern of cities and regions was influenced, sometimes in a decisive way, by various public programmes and policies. This awareness has led to an increased interest in urban and regional statistics and related impact analysis in order to be able to assess the consequences of various types of policies in a systematic and coherent way.27/ Consequently, in the 1970s several countries (e.g., France, Great Britain, Sweden, Canada, U.S.A., and the Netherlands) have tried to design impact analysis in order to judge the geographical implications (in cities and regions) of policies at various institutional levels so as to improve the efficiency and equity of policymaking.

This way of systematically and coherently evaluating the geographical dimensions of public policies has been induced by the increasing influence of the public sector in a complex society, the need to critically judge the effectiveness of large amounts of public expenditures for individual programmes and policies, the general desire to use existing information in a more efficient way, and the necessity of understanding complex intergovernmental interactions in multilevel institutional systems. Clearly, information systems are of crucial importance for an effective urban and regional planning.

As already mentioned, information systems in the developed world are not always well developed: They may suffer from inconsistencies, gaps, unreliable data, or wrong levels of measurements. Even more severe shortcomings can be observed regarding information systems in developing countries. Consequently, it is often very hard to describe the factual developments, let alone the impacts of various development policies. Yet, it is important to gain more insight into the geographical aspects of public policies in developing countries, as no satisfactory tool exists to measure the effectiveness of such policies.

In regard to regional developments, there is a general tendency in many developing countries that interregional welfare discrepancies are increasing, that rural areas are becoming less able to reach their first take-off stage, that infrastructure facilities are often insufficient to stimulate regional growth, that using energy costs affect the welfare prospects of peripheral areas, and that perpetuating interregional gaps in welfare reinforce the trend toward more regional autonomy.28/

Urban developments also display drastic changes : There is a strong trend for cities in developing countries to continue to grow, while the number of jobs and dwellings is hardly increasing.29/ In addition, a dual (or segmented) labour market is emerging, while the informal sector is growing. Finally, the decay in urban quality of life caused by pollution, congestion, and social alienation has led to severe problems in large agglomerations in third world countries.

The spatial dynamics in developing countries has led to the need for appropriate policy programmes, such as demographic and migration policies, rural development strategies, and urban revitalization programmes. In addition, various policies have been developed without an explicit geographical connotation, which have turned out to have strong spatial repercussions (e.g., labour market policies, national energy savings programmes, and industrial development programmes). Both rural and urban policies in the developing world are aimed at inducing a process of modernization and progress by providing opportunities for economic and social advancement.30/

The foregoing observations made clear that in the light of the poor information systems in developing countries, a rigorous attempt has yet to be made to assess all direct and indirect geographical (urban and rural) impacts of public policies. Unfortunately, in many cases no formal econometric models can be used, so that more general systems analytic methods which are more suitable for the specific problems of developing countries have to be developed.31/

In general, a systems representation of a region or city may include the following components or subsystems: (a) an economic subsystem; (b) a facilities subsystem; (c) a demographic subsystem; and (d) a social subsystem.

These subsystems can be distinguished for both urban and rural areas so as to encapsulate also the urban-rural duality. An example of such a comprehensive system for urban agglomerations is given in figure 6.

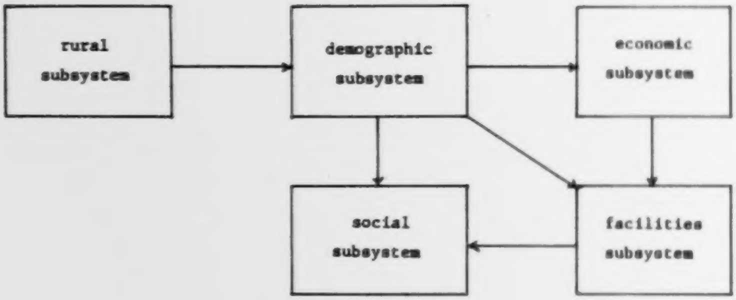

rural subsystem
demographic subsystem
economic subsystem
social subsystem
facilities subsystem

Figure 6. A spatial system with various subsystems

The various subsystems can be further subdivided into interactions between the constituent elements. For instance, the demographic subsystem can be represented as in figure 7.

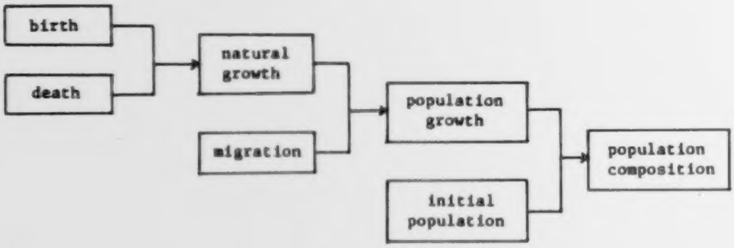

birth
death
natural growth
migration
population growth
initial population
population composition

Figure 7. A simple representation of the demographic subsystem

In a similar way, all other subsystems can be depicted.32/ The degree of complexity of these subsystems will depend on the policy objectives at hand and on data availability. Each of these subsystems can be encompassed by figure 6, so that ultimately a comprehensive, but comprehensible picture of the spatial system concerned may emerge.

It should be emphasized that the successive subsystems are not closed. There are strong mutual interactions between all subsystems. Examples are: a rise in population affects the situation on the labour market; more urban in-migration requires more facilities and dwellings; more medical facilities influence the birth and death rates; high income differences cause more geographical mobility.

Thus, these linkages have to be included as well. This may lead altogether to a fairly complex systems model, but this representation is a necessary condition for understanding the complex impacts of public policies.

The next step is to indicate where (i.e., at which component of the system) public policies will have a major impact. For instance, educational policy will have a first and major influence on the facilities subsystem.

Then the next logical step to be undertaken is to assess as accurately as possible the direct (first-order) effects of the policy or programme at hand. During the first stage, many impacts can be gauged in quantitative terms. After the assessment of the direct effects, the second-order effects have to be estimated by just following the various arrows in the systems framework. Here again no formal models are necessary, but it may of course be problematic to assess all second-order impacts in quantitative terms. If this is not possible, qualitative inferences may be drawn (e.g., ordinal rankings, verbal statements such as 'good', 'better', 'best', nominal or binary information, and probabilistic statements). This procedure can be repeated for the third- and higher-order impacts, so that a final impact matrix may contain both quantitative and qualitative information.

In conclusion, the arrow scheme of a systems model may provide a coherent and integrated picture of a complex spatial system and is suitable for a qualitative impact assessment in the case of weak information systems. This approach may also be helpful in a coordinated national, regional, rural, and urban policy framework. An extensive empirical application for the city of Bhubaneswar in India can be found in Nijkamp and Van Pelt.33/

Finally, it should be noted that such systems approaches can also be extended to scenario analysis and multicriteria evaluation analysis, so that spatial impact analysis may provide a useful contribution to an operational policy analysis in developing countries.

Necessary Data for Urban Developments

Many of the abovementioned general remarks on statistics and information systems for urban and regional planning apply also to developing countries. Such criteria as systematics, completeness, and coherence are generally valid. Yet, one may also mention some specific criteria which are particularly relevant for the design of statistical information in developing countries.

In many developing countries, the use of computers in data systems is less advanced than in the Western world. This means that the potential provided by automated information systems is sometimes missing, so that the design of large-scale integrated information systems is becoming problematic. Consequently, much attention has to be focused on simplicity and manageability in data banks for urban and regional planning in developing countries.34/

Moreover, the specific scope of information systems in developing countries may also be different. The contents of such information systems is very much determined by the specific problems in the countries (e.g., malnutrition, overurbanization, population explosion, and socioeconomic inequalities). Consequently, statistics in these countries should focus much attention on data collection and data production with respect to urbanization, nutrition, education, fertility, infant mortality, housing, and the informal sector.

Such data are especially necessary for urban agglomerations, as the urban population of developing countries is growing at a very rapid rate. It is expected that before the year 2000 urban communities in developing countries will have to absorb approximately one billion inhabitants. Also the number of large cities in developing countries is increasing rapidly: It is expected that before the year 2000 at least forty cities in developing countries will have more than 5 million inhabitants. Clearly, such developments imply tremendous challenges for national, regional, and urban policies in developing countries, especially because such policies have to fulfill both efficiency and equity considerations.35/ Some trends for India can be easily observed from table 1.1.

TABLE 1.1. PERCENTAGE DISTRIBUTION OF URBAN POPULATION BY SIZE-CLASS OF TOWNS IN INDIA

Census Year	100,000 and over	50,000 to 90,000	20,000 to 49,000	10,000 to 19,000	5,000 to 9,999	under 5,000
1901	22.9	11.8	16.5	22.1	20.4	6.3
1911	24.2	10.9	17.7	20.5	19.8	6.9
1921	25.3	12.5	16.9	18.9	9.0	7.4
1931	27.4	12.0	18.8	19.0	17.3	5.6
1941	35.4	11.8	17.7	16.3	15.4	3.4
1951	41.8	11.1	16.7	14.0	13.2	3.2
1961	48.4	11.9	18.5	13.0	7.2	1.0
1971	52.4	12.2	17.4	12.0	5.2	0.8

Source: B. Renaud, "National Urbanization Policies in Developing Countries" (Staff paper; no. 347) (Washington, DC: World Bank, 1979).

Tensions between efficiency and equity may emerge, if for instance urban labour supply expands more rapidly than urban labour demand (thus limiting the growth of urban wages and income, especially for unskilled workers) or if the demand for urban facilities expands more rapidly than their supply (thus causing price rises in urban land, houses, and public services). Fiscal systems may provide several tools to take into account the valuable position of the poor in designing urban development programmes. In addition, effective transport policies (with more emphasis on cheap transportation for the poor) and deliberate housing policies (based on reliable estimates of housing needs and of the implied resource requirements, for instance, via a basic need approach) may lead to a reconciliation of efficiency and equity aspects. The same holds true for education, health, and nutrition. A basic problem is, of course, the fact that in many cities in the developing world insufficient and unreliable data prevent a careful inventory of trends, so that it is extremely difficult to provide public policies with adequate foundation stones. In addition, in many developing countries the socioeconomic discrepancy at the regional level and also within urban areas has not diminished despite intensive policy efforts. A good illustration of the rigidity of international inequalities can be found in table 1.2, reflecting the share of major regions in Brazil in the Net Domestic Product during the years 1939-68.36/ Without precise data, however, it is almost impossible to implement effective policy strategies for diminishing socioeconomic discrepancies in space and time.

TABLE 1.2. SHARE OF MACRO REGIONS IN BRAZIL (IN NET DOMESTIC PRODUCT)

	1939	1947	1955	1960	1966	1968
North	2,6	1,7	1,7	2,2	2,1	2,1
Northeast	16,8	15,6	12,6	14,8	14,4	14,4
Southeast	62,9	64,2	65,3	62,7	63,1	62,9
(incl. Sao Paulo)	31,1	32,6	35,9	34,7	34,7	35,2
South	15,5	16,8	17,9	17,7	17,3	17,3
Central West	2,2	1,7	2,5	2,6	3,1	3,3
	100,0	100,0	100,0	100,0	100,0	100,0

Examples of Urban Data Systems

A first fact which can be observed in almost all statistics is the high urbanization trend in developing countries. In almost all developing countries, the urban population growth rate is much higher than the total population growth rate (for an illustration see table 1.3). It has, however, not yet been established by researchers, to what extent urbanization is instrumental or detrimental in bringing about socioeconomic development of societies.37/ From a purely economic point of view, it may be argued that urbanization may promote economic development through more efficient use of resources via agglomeration economies. Others are more critical of urbanization and claim that some developing countries have already reached an overurbanized stage and that further urbanization would only have adverse effects on socioeconomic development. Some propose curbing urbanization by developing rural areas in more effective ways and promote such concepts as "Agropolitan Development"38/ or "Selective Regional Closure."39/ The arguments used are, however, sometimes not well-founded because they are based on preconceived notions supported by scarce empirical observations. Even though the relationship of urbanization with economic development is a well-studied subject, its relationship with social development is not systematically examined.

The foregoing remarks make clear that it is difficult to design integrated information systems for urban planning, if the causalities and the impacts patterns related to urbanization are unknown. In any case, one would need information on: income and production, urban demographic structure, nutrition rates, life expectancy, infant mortality rate, adult literacy rate, fertility rate, school enrollment, productive capital, urban infrastructure investments, medical facilities, labour market indicators, residential housing indicators, and transportation indicators.

However, depending on the causal patterns and the specific impacts one is interested in, the contents and structure of an urban information system will have to be built up. Given the many uncertainties involved, it is no surprise that in the third world countries hardly any integrated and coherent urban information system serving long-run policy purposes has been constructed. Many urban data and information systems are either ad hoc or incoherent, or partial or short-run oriented. Altogether, it may be concluded that the abstract methodological requirement that an information system should be all-embracing and integrated is nonfeasible for developing countries.

Therefore, a more modest step seems to be to orient the design of information systems on more precisely demarcated policy fields, such as the housing market, the labour market, and medical facilities, and to design a coherent (partial) information system for a specific policy field. Consistency with respect to other policy fields can then be achieved by using a so-called 'satellite' design. Such a satellite pattern indicates that the kernel of an information system is made up of a particular field of policy interest, and that only in a more global sense relationships with other modules (from other information systems) are established (see figure 8).40/ Several examples may clarify the plea for systematic, partial, and accessible information systems for urban planning purposes.

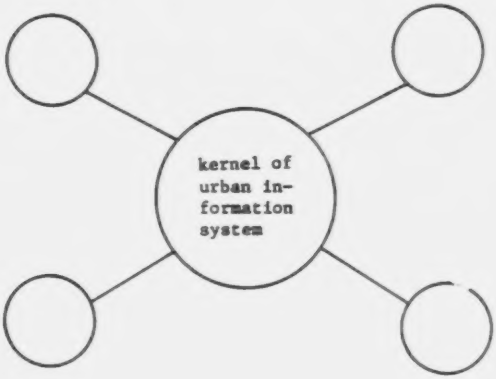


Figure 8. A satellite structure of an urban information system

TABLE 1.3. POPULATION DISTRIBUTION INDICATORS

Country	(1) GNP per capita ($)	(2) Total pop. growth rate 1970-75	(3) Urban pop. growth rate 1970-75	(4) Pop. of largest city (000)	(5) Overall primacy index	(6) 4-city primacy index	(7) Net migration/ urban growth share	(8) Urban-rural growth differential
Saudi Arabia	4,480	2.4	6.3	667	23	0.58	.619	4.43
Venezuela	2,570	3.1	3.9	2,673	27	1.23	.025	5.90
Iran	1,936	2.8	4.7	4,435	30	2.34	.404	2.59
Argentina	1,550	1.3	2.0	8,436	46	1.55	.350	3.18
Iraq	1,390	3.3	5.0	3,433	50	1.99	.340	4.18
Brazil	1,140	2.9	4.5	9,965	15	0.81	.356	3.89
Mexico	1,090	3.5	4.6	11,943	29	2.63	.239	3.37
Chile	1,050	1.8	2.7	2,850	36	4.82	.333	4.27
Egypt	1,001	2.2	3.9	6,932	39	1.64	.436	2.66
Turkey	990	2.5	4.2	3,255	19	0.98	.405	4.11
Algeria	990	3.2	5.7	1,179	14	1.25	.439	5.35
Cuba	860	1.8	2.9	2,269	39	1.46	.379	1.56
Malaysia	860	2.7	4.7	452	16	0.69	.426	1.96
Peru	800	2.9	4.2	3,901	45	3.38	.310	2.59
Syria	780	3.3	4.2	1,053	32	0.86	.214	1.72

(TABLE 1.3 continued)

Korea	670	1.8	4.9	7,286	45	1.54	.633	5.71
Colombia	630	2.8	4.9	3,416	21	1.09	.429	4.08
Morocco	540	2.4	5.1	1,856	28	1.26	.529	3.29
Zambia	440	2.9	6.8	448	30	0.57	.574	6.38
China	410	1.7	3.3	10,888	6	0.76	.485	3.79
Philippines	410	2.8	4.8	4,444	28	0.75	.417	1.38
Bolivia	390	2.7	4.0	655	33	1.18	.325	2.08
Thailand	380	2.9	5.3	3,277	47	14.59	.453	1.99
Nigeria	380	2.5	7.0	2,064	18	0.63	.643	2.60
Sudan	290	2.1	5.5	803	33	0.53	.618	2.55
Indonesia	240	2.4	4.7	5,593	21	1.34	.489	2.32
Kenya	240	3.5	6.3	699	49	1.68	.444	3.11
Sri Lanka	200	1.7	4.3	655	19	-	.605	2.57
Tanzania	180	2.7	7.5	517	50	-	.640	2.89
Pakistan	170	3.0	5.3	4,465	24	0.97	.434	2.68
Afghanistan	160	2.2	5.4	749	25	0.67	.593	3.27
India	150	2.1	3.8	8,077	6	0.67	.447	1.11
Zaire	140	2.7	6.4	2,088	32	4.05	.578	8.82
Burma	120	2.2	4.8	2,449	35	1.88	.542	3.03
Bangladesh	110	2.0	3.8	1,918	31	1.14	.474	1.79
Viet Nam		2.6	4.6	2,046	-	1.63	.435	2.65

Source: Compiled from data presented in B. Renaud, National Settlements Policies in Developing Countries (Washington, DC: World Bank, 1979)

Faissol describes a data system for urban poverty in Brazil in the context of the organization of the labour market.41/ Starting from the concept of minimum wage, he seeks to design a data base related to family size, the source of payment, the structure of the labour market, employment, and a dual urban system. Thus, the kernel of the information system is poverty, including income and consumption patterns (e.g., television, nutrition, flush water, and homeownership), while the related components of this system are the labour market, including social securities, self-employment, sources of income, and educational system. A brief illustration of some significant results in Brazil is contained in table 1.4.

TABLE 1.4. SELECTED STATISTICS FOR POOR AND RICH REGIONS IN BRAZIL (1976)

	poor region	rich region
% of households		
stove (electr. or gas)	40	80
refrigerator	23	55
televisions	28	60
car	8	20
running water	23	50
sewage	12	40

Another example concerns migration in India.42/ The Indian labour market may be regarded as very distorted, *inter alia* due to the highly unbalanced distribution between the rural agricultural sector and the urban industrial sector. The countryside is overpopulated and agriculture has no excess capacity to absorb the growing labour supply, except at the peak cropping season, whereas the cities have a restricted demand for labour because of the capital-intensive nature of their industry. In contrast with common views, the data system based on the Indian census data makes clear that the most important stream is not rural to urban migration, but rural to rural migration, which covers 70 per cent of all migration. This stream is not very important from a demographic point of view because it does not change the population pattern. Rural to rural migration is mainly seasonal, of short distance, or caused by social factors such as marriages. The spatially unbalanced rapid urban industrial growth pattern has caused increasing spatial inequality and induced high net rural to urban migration. This migration has caused important changes in population patterns in cities.

The rural poor, socially and economically deprived, who migrate to the city, are confronted with new problem situations like the slums (bustees) and shanties of the cities, so that essentially they are transferred from one level of poverty to another, having a subhuman living. Because they lack the skills for getting a job in the urban industrial sector, they are attracted to the nonproductive service activities in the informal sector. In conclusion, the kernel of the information system concerned focuses attention on the migration sector, while derived attention is given to housing and labour market conditions.

Hewings provides some specific examples of model building and their application under conditions of limited information.43/ The concerns of spatial planning in the developing country context are illustrated with a sample of some of the analyses and methodology used to date, centring on a Sri Lankan model and on a two-region simulated dissaggregation of that economy. Hewings pays particular attention to some important issues in using interindustry analysis which need to be resolved: First, how can the important parameters be identified at the regional or local level without the prior collection of data for all elements of an input-output system? Second, the analysis operates by changing one parameter at a time, for which column sensitivity in the system can be evaluated. In developing economies under conditions of rising per capita incomes (as a result of a project), significant changes in one of two elements in the system could trigger significant changes in another element which, alone, might not have been considered inversely important. Information systems based on such interindustry calculations can be particularly useful in assessing the impacts of urban or regional policies. Thus, the centre of such an information system is made up of an interindustry block, while the peripheral components may relate to labour markets, consumption patterns, and so on.

Lakshmanan pays particular attention to income distribution in developing countries (see also table 1.5).44/ His analysis suggests that the framework for analysis of technical changes, economic development, and income distribution in a region needs to be broader than is found in economic development theory. A developing region should be conceptualized as a system comprised of four related and interacting elements -- economic assets, organizational structure, incentive structure provided by institutions, and external relations. It is argued that the interrelationship between these elements in a region determines the distribution of income. The introduction of technical change -- a shift in the production function -- would lead presumably to greater efficiency, increased economies of scale, and factor substitution. The division of the increased output, however, is determined by the same four elements of the

TABLE 1.5. THE EXTENT OF POVERTY IN BRAZIL: FAMILIES UNDER TWO MINIMUM WAGES, 1974-75

Regions	Total Families ('000)	Per cent Poor in Region	Number Poor ('000)	Regional Distribution of Poverty (Percentage)
Rio	2,169	11	244	4
Metropolitan	1,784	9	163	3
Other Urban	209	14	28	1
Rural	176	30	53	1
Sao Paulo	4,168	9	385	7
Metropolitan	2,078	5	103	2
Other Urban	1,413	11	156	3
Rural	677	19	126	2
South	3,548	15	520	9
Metropolitan	601	8	48	1
Other Urban	1,162	13	147	3
Rural	1,785	18	325	6
Minas G. & E.S.	2,592	30	788	14
Metropolitan	367	14	52	1
Other Urban	1,034	25	260	5
Rural	1,191	40	476	9
Northeast	5,791	52	3,008	54
Metropolitan	844	27	231	4
Other Urban	1,673	44	731	14
Rural	3,274	62	2,046	37
North & D.F.	2,032	30	619	11
Metropolitan	156	4	6	-
Other Urban	918	25	230	4
Rural	958	40	383	7
Total	20,300	27	5,566	100
Metropolitan	5,830	10	603	11
Other Urban	6,409	24	1,554	28
Rural	8,061	42	3,409	61

regional system described above. Thus, the kernel of this particular information system is made up of income data which are in turn determined by determining components.

Another example concerns a data system for Ile-Ife (Nigeria) discussed by Abioudun.45/ This data system is concerned with questionnaire-based information on residential units in the city, with particular emphasis on the types of dwellings occupied by specific household categories. The main focus is on the quality of residential areas (being the centre of the information system), and subsequently, due attention is given to various household categories.

A final example of urban information systems is offered by Kamble, who designed a data base for Madras.46/ He tried to collect information on labour and housing market characteristics related to urban in-migration in Madras, based on systematic census data. In this context, demographic data (e.g., fertility patterns) were also included. The industrial sector was subdivided into detailed branches (or sectors), and the occupational structure was studied in greater detail. Thus, the kernel of this data system was constituted by industrial employment data; the evolution of these data was studied by means of in-migration and demographic information, and the impacts were mainly related to social, occupational, and residential consequences.

Some Caveats in International Comparisons of Information Systems

A first observation which can be made is that many urban and regional data systems in developing countries are partial and not fully integrated, and focus on a specific policy aspect. Integrated information systems linking many urban and regional system components are rare. Relationships with other policy issues can, however, be taken into account in particular data systems, as was demonstrated by the satellite approach as a methodological frame of reference. This approach may also be an extremely useful device for making cross-national comparisons on the basis of a joint reference pattern. Second, the regional and urban data and information systems exhibit a great variety. It should be added, however, that diversity in spatial information systems is also reflected in the Western world.

A final point which has to be mentioned in regard to information systems is the sensitivity of the results of data collection for definitions of variables and ways of gathering statistics. This issue is particularly important in the case of a cross-national comparison of statistics. A striking example of differences in urban statistics due to survey techniques versus census techniques can be found in table 1.6,47/ which represents significant discrepancies in indicators for the housing market in Bogota, Colombia.

In general, a precise definition of concepts (e.g., poverty line, education, slums, squatters, health conditions, and basic needs) is a prerequisite for international comparisons. In this respect, much more emphasis has to be placed on designing uniform measures in developing countries in order to allow more appropriate cross-national studies.

TABLE 1.6. CHARACTERISTICS OF HOUSING IN BOGOTA, COLOMBIA (PER CENT OF HOUSEHOLDS)

Characteristics	1973 Census	Survey
Type of dwelling		
Independent house	49.20	62.60
Apartments	8.80	17.40
Room	1.20	20.00
Inquilinato (leased)	38.90	n.a.
Other	1.20	n.a.
Number of rooms occupied by household		
1	43.98	20.77
2	21.20	21.50
3	9.40	19.55
4 or more	18.85	38.20
No reply	6.61	n.a.
Water connexion		
Exclusive piped water	33.21	83.02
Shared piped water	62.44	13.28
Other	4.35	3.70
Mode of tenure		
Owner-occupied	26.32	52.02
Rental	58.43	42.35
Squatter	0.59	n.a.
Other	14.66	5.37

Note: n.a. Not available

Caveats in Designing Specific Information Systems: The Labour Market

A major desideratum concerning statistical data is that the data are coherent. Coherence has several dimensions.

1. For a time series of one particular variable, coherence means that observations at different points in time are comparable. Hence, no substantial changes in definitions, classifications, counting conventions, and procedures to reduce observation errors, may occur. Changes in basic areal units should also be mentioned.

2. For a regional cross-section of one particular variable, coherence means that observations are comparable among regions according to the viewpoints mentioned above. Problems may arise, for example, in the case of insufficient coordination between regional agencies active in the field of data collection and manipulation. Coherence may especially become problematic when regional data are collected from different countries.

3. For data on a set of variables, coherence means that in addition to the above requirements, a standardization of classifications and a synchronization among variables are achieved.

Another desideratum concerning statistical data is that they are complete in the sense that no major dimensions have been left out so that the data set can be used for a broad range of purposes.

In the context of labour markets, completeness can be elaborated as follows: a complete system of labour market data deals with both labour supply (including unemployment) and labour demand (including vacancies). Concerning the persons and/or positions involved in supply and demand, data should be available on standardized classifications with respect to sex, age, nationality, education, occupation, economic sector, wage, number of hours worked, and qualitative aspects of labour conditions. Regarding regional labour markets, in particular, data should be available on the places of work and residence.

Figure 9 gives a visual representation of demand and supply on the labour market. It clearly indicates that there are two units of observation involved: persons and positions.

The type of information needed may change from time to time, depending on the rapidly changing conditions on the labour market. The above list is a good starting point for most purposes. For special purposes, the classifications may have to be refined, or new items may be added. For example, in recent years there is a growing interest in informal, unpaid, "grey," and "black" activities on the labour market, which are usually not covered by labour market information systems.

For an appropriate understanding of the labour market, data on stocks, such as employment and unemployment, are clearly important. In addition, knowledge on flows is important for an insight into the dynamics on the labour market. Examples of such flows are: the flows of persons entering and leaving the market, changing positions, becoming unemployed, and moving from one region to another.

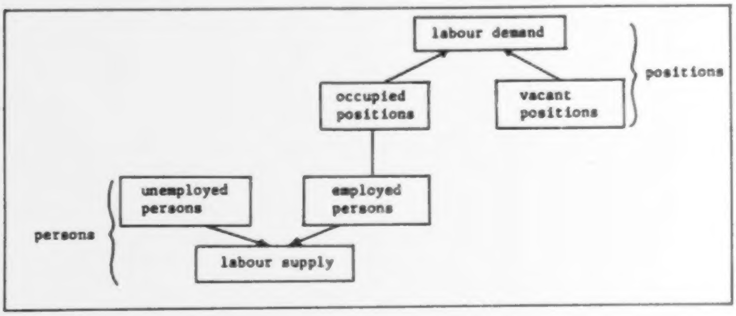


Figure 9. Supply and demand on the labour market

Labour markets are strongly influenced by demographic and economic (industrial) conditions, as well as by the structure of educational and social welfare systems. Therefore, the completeness desideratum implies that these fields also are covered by information systems for regional labour markets. The desiderata of coherence and completeness may be conflicting: The broader the coverage of a data system, the more difficult it will be to achieve a standardization of classifications and definitions.

In addition to coherence and completeness, other desiderata can be formulated for data on regional labour markets. Timely availability is one of them. This desideratum is especially important when statistical data are used for policy-making purposes. Without recent data, half-term evaluations of policies cannot be carried out in an adequate way.

Sufficient length of time series is a desideratum which is especially important for research and modelling. Short time series hamper the discovery of structural developments. Often, long time series can only be obtained when a certain loss of coherence is accepted: Changes in definitions are a common feature of labour market data.

Another desideratum is reliability, which means that measurement errors should be small. In practice, two types of errors occur: systematic and random ones. The problem of random errors can be essentially resolved by increasing the number of observations. Systematic errors are harder to deal with. For example, the absence of black-income jobs in employment figures is a serious threat to the quality of statistical data on the labour market.

The last desideratum has been discussed in the preceding section: flexibility in regionalization. Since each research or policy problem may have a regional orientation, statistical data systems should be flexible enough to produce data according to a desired regionalization. A consequence is that basic data should be available at a high level of spatial detail.

Concerning the developing countries, the abovementioned considerations have to be elaborated, in particular with respect to: segments on the labour market (e.g., duality, formal and informal sectors, employees and self-employed, natural population growth, migration, participation rate, education, growth of the economy (especially industry, service, and public activity), technology, spatial mobility (e.g., commuting), and urban growth. Several illustrations and references concerning such data systems can be found in Linn.48/

Conclusion

Information systems have often been designed for specific purposes (e.g., transportation data for transportation policy and housing data for housing market policy). Clearly, there are various rational (institutional and technical) reasons why integration of information systems is hard to achieve in current planning practice. A lack of integration means an enormous waste of effort. It would be a significant step forward, if national or regional Bureaus of Statistics were authorized to provide uniform rules for data collection and standard classifications for economic activities, even if it would concern information systems beyond the responsibility of these bureaus. Experience in technical and medical sciences has demonstrated the power of uniform rules and classifications, and there is no logical reason that would prevent the design of a standard frame of reference for the design of spatially-oriented information systems. The cross-national comparison of information systems in six countries has demonstrated that there is a serious lack of uniformity in data and information systems, so that cross-national comparisons have to be carried out very cautiously.

In addition, the modern computer hardware and software facilities provide a great deal of possibilities for coupling different information systems. In this respect, public planning agencies may learn extremely meaningful lessons from multiplant and multiregion corporate organizations, which in general, have been able to solve the organizational problems of dealing with enormous diversified data bases. In this regard, the organizational aspects of internal communication within public agencies deserve more attention. Modern (electronic) networks provide a huge potential for improving acquisition, communication accessibility, efficiency, monitoring, and public participation, in complex public choice problems. Similarly, the software facilities are as important as the information that will be produced by them. In this regard, it is regrettable that computers still play a minor role in modern spatial information sytems.

A major part of the present paper has been devoted to the relationship between information systems and urban/regional development planning. It should be noted, however, that information systems are not only a tool in public policy, but may also act as a stimulus for regional and urban development processes. It has been argued by several authors,49/ that information systems (e.g., contact systems and communication flows) may exert a significant impact on industrial location patterns, especially of corporate organizations. Thus, although information systems are of major significance for regional and urban planning, they exert, at the same time, an impact on spatial developments.

In an interesting article, Goddard has pointed out the impact of corporate organizations (especially when defined in terms of the location of nonmanufacturing functions and their information flow networks) on regional and urban development processes (e.g., through diffusion of technological innovation, polarized development, and regional external economies).50/ Consequently, the management of contact networks through investment in advanced telecommunications, communications audits, and the designation of growth centres based on information exchange functions, can become an important policy instrument for organizations and public sector agencies concerned with regional development. Thus, the contact pattern of multilocation, multiproduct corporate organizations may exert an important impact on regional and urban growth processes and on the effectiveness of regional and urban policies. Communications audits administered by a public agency may become an appropriate tool in regional and urban policy by highlighting for firms opportunities for alternative locational/organizational arrangements, especially the advantages to be gained through locating different but complementary functions in the same area. Unfortunately, such important issues have not yet been adequately covered by spatial information systems in various countries.

One aspect which is often absent in regional analysis is a comparative evaluation of urban and regional systems and how they have evolved and changed over time. In the concern for completeness and accuracy, some broad-brush pictures of the regional system and its evolution and likely future developments tend to be ignored. As a result, the schism often made between the need for policy analysis with partial or simplified models and the use of large-scale models for essentially scientific analysis has become a rather pervasive feature.

Although many countries have amassed an incredibly large collection of regional and interregional information systems, scientific analysis has tended to focus on the character of the models rather than the regions which they were representing.51/ The spatial orientation of many information systems — in general — is not extraordinarily rich. Two important aspects may be distinguished in this respect, viz., the spatial scale and the spatial flows.

In many countries, there is often a lack of consensus between the spatial scale of information systems and that of actual planning problems due to discrepancies between administrative (or legislative) and socioeconomic regional demarcations. In this respect, a closer orientation of information systems toward administrative units is desirable. Given the multilevel pattern of regional decision making, it is in general an appropriate strategy to build up information systems in a bottom-up fashion so as to let them flexibly fit into any desired level of regional planning and policymaking. Computerized information systems (e.g., geocoding) may mean an important progress in user-friendly data processing activities. But it is at the same time clear that many efforts have to be made before complex geographical processes (e.g., filtering processes) can be fully described. The current state of the art in this respect is fairly poor.

The second problem concerns the lack of information regarding spatial flows. These flows may be categorized into physical and nonphysical flows. In general, there is a reasonable amount of information regarding physical flows (e.g., people and commodities). However, as far as nonphysical flows (e.g., money flows and knowledge) are concerned, there is a serious lack of knowledge. Consequently, the distributional impacts of many public policy measures on spatial equity are very hard to judge. The lack of money and finance in regional economics and regional planning is especially noteworthy, because in the early history of regional economics some attention has been given to an analysis of regional variations in spatial interest rates 52/ and of spatial flows of funds.53/ The usual arguments are that money and financial capital are perfectly mobile, so that it suffices to focus attention only on the real side of the economy. As indicated by Karsch,54/ this view neglects the recent ideas developed in monetarism and neo-Keynesianism and fails to explain why regional unemployment is not only a result of long-term structural change, why capital mobility is not only induced by labour mobility, and why banking and finance tends to agglomerate in a few places. In this regard, spatial information systems would need a significant improvement.

An information system should be versatile (i.e., accessible to various groups of users and for various objectives). Such a polyvalent nature of information requires a specific presentation for each relevant group (e.g., planners, model-builders, systems analysts, statisticians, data processing specialists, policymakers, and public interest groups). It is a far from easy task to develop a desirable computer software to ensure flexibility in using information systems for various purposes (including a dialogue between various users).

User-oriented information systems are necessary in order to improve the communication between analysts and policymakers and to avoid a "black box" view of policy analysis and modelling. Modern communication and information technology offers many perspectives in this regard, as analytical tools can be made more accessible to policymakers through desk-top computer terminals and user-friendly software (e.g., interactive computer graphics). Recent developments in adaptive information systems have to be applied in regional planning in order to bridge the gap between information experts and responsible policy agencies.55/

The current information society needs rapid access to statistical information. The obstacles in obtaining appropriate data on time -- in usable form -- may be caused by unavailability of basic data (e.g., financial flows data) or underutilization of existing data bases. An important lesson to be drawn from this situation is that more information also is needed on the contents and structure of current information systems. In the case of lack of data, it has to be emphasized that the widespread availability of computers today also means that users may process statistical data themselves, as is also reflected in the current popularity of machine-readable data files. Furthermore, public agencies should be aware of a wide variety of data finding aids, such as published catalogues and indexes, table finding guides, and computerized cataloguing and query systems.56/ Recent developments in the field of decision support systems and artificial intelligence systems indicate that modern computer technology (especially with regard to data base management, data retrieval, and data display) offer many new perspectives for adaptive information systems in a situation of socioeconomic dynamics.

Our analysis has indicated that in the majority of countries regional and urban information systems are not yet fully developed. The potential use of modern information technology is much higher than its current use. This may be due to the expected high costs, lack of insight, institutional rigidities, and lack of coordination. But it should also be realized that a more adequate design and use of modern information systems for urban and regional planning may lead to much higher social benefits, as then the quality of decision making will no doubt be improved.

A particularly important issue in designing and using information systems for urban and regional planning is the lack of accessibility of statistics. Data are often scattered over many offices using their own spatial administrative definitions. The coherent coordination of such statistics toward accessible information systems which can be readily and effectively used in urban and regional planning is one of the most formidable tasks for information experts in developing countries.

NOTES

1/ See also P. Nijkamp and P. Rietveld, eds., Information Systems for Integrated Regional Planning (Amsterdam: North-Holland, 1984).

2/ See also J.G. Burch, F.R. Strater, and G. Grudnitski, Information Systems: Theory and Practice (New York: Wiley, 1979).

3/ Refer to T. Sowell, Knowledge and Decision (New York: Basic Books, 1980).

4/ See also D.J. Casley and D.A. Lury, Data Collection in Developing Countries (Oxford: Clarendon Press, 1981).

5/ D. Braybrooke and C.E. Lindblom, A Strategy of Decision (New York: Free Press, 1979).

6/ B. Issaev et al., eds., Multiregional Economic Modeling: Practice and Prospect (Amsterdam: North-Holland, 1982).

7/ See D.V. Gokhale and S. Kullback, The Information in Contingency Tables (New York: Dekker, 1978).

8/ See Burch, Strater, and Grudnitski, Information Systems.

9/ Th.J. Wilbanks and R. Lee, "Policy Analysis in Theory and Practice" in B. Johansson and T.R. Lakshmanan, eds., *The Regional Consequences of Large-Scale Energy Development* (Amsterdam: North-Holland, 1984).

10/ P. Nijkamp, *Multidimensional Spatial Data and Decision Analysis* (Chichester: Wiley, 1979).

11/ See C.R. Blitzer, P.B. Clark, and L. Taylor, eds., *Economy-Wide Models and Development Planning* (New York: Oxford University Press, 1975).

12/ See P. Nijkamp, "Urban Impact Analysis in a Spatial Context" (Research memorandum 1981-5) (Amsterdam: Dept. of Economics, Free University, 1981); and S. Pleeter, *Economic Impact Analysis* (Boston, MA: Martinus Nijhoff, 1980).

13/ See also N.J. Glickman, "Impact Analysis with Regional Econometric Models" in S. Pleeter, ed., *Economic Impact Analysis* (Boston, MA: Martinus Nijhoff, 1980).

14/ See N. Lichfield, P. Kettle, and M. Whitbread, *Evaluation in the Planning Process* (Oxford: Pergamon Press, 1975).

15/ For a survey, see also Nijkamp, *Multidimensional Spatial Data and Decision Analysis*.

16/ See P. Nijkamp, "Information Systems for Regional Development Planning: A State-of-the-Art Survey," *Environment and Planning B* 10 (1983): 283-302.

17/ See also P. Nijkamp and M. van Pelt, "Spatial Impact Analysis for Developing Countries: A Framework and a Case Study" (Research memorandum 1983-1) (Amsterdam: Dept. of Economics, Free University, 1983).

18/ See also C.T. Bowman and R.E. Kutscher, "The Labor Market Data Base for Multiregional Models" in F.G. Adams and N.J. Glickman, eds., *Modeling the Multiregional Economic System* (Lexington, MA: Heath, 1980), pp. 57-64; D.H. Garnick, "The Regional Statistics System" in Adams and Glickman, eds., *Modeling the Multiregional Economic System*, pp. 25-48; and R. Torene and D. Goettee, "Towards a General Purpose Economic Data Base" in Adams and Glickman, eds., *Modeling the Multiregional Economic System*, pp. 65-72.

19/ See also T. Hermansen, "Information Systems for Regional Development Planning" in T. Hagerstrand and A.R. Kuklinski, eds., *Information Systems for Regional Development* (Lund: University of Lund, 1971), pp.1-37.

20/ See also Issaev, *Multiregional Economic Modeling*.

21/ Ibid.

22/ For more details, see Nijkamp and Rietveld, *Information Systems for Integrated Regional Planning*.

23/ See also S. Flitton, "Information for Regional Planners," *Options* (IIASA) 1 (1984): 6-9.

24/ See L. Chatterjee and P. Nijkamp, eds., *Urban and Regional Policy Analysis for Developing Countries* (Aldershot, U.K.: Gower, 1983).

25/ L.S. Bourne and J.W. Simmons, *Systems of Cities* (New York: Oxford University Press, 1978); and J.W. Lapatra, *Applying the Systems Approach to Urban Development* (Dowden, U.K.: Hutchinson and Ross, 1973).

26/ See also L. Chatterjee and P. Nijkamp, eds., *Urban Problems and Economic Development* (Alphen aan den Rijn, Netherlands: Sijthoff and Noordhoff, 1981); W.F.J. van Lierop and P. Nijkamp, eds., *Locational Developments and Urban Planning* (Alphen aan den Rijn, Netherlands: Sijthoff and Noordhoff, 1981); and P. Nijkamp and P. Rietveld, eds., *Cities in Transition* (Alphen aan den Rijn, Netherlands: Sijthoff and Noordhoff, 1981).

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Chapter 2

COMMUNICATION ON THE 1981 PACIFIC ISLANDS PILOT PROJECT ON ENVIRONMENTAL STATISTICS AND THE FIJI FIELD TEST AND INTEGRATED AREA DEVELOPMENT AND COMMUNICATION AND INFORMATION SYSTEMS

Luciano Minerbi

OVERVIEW

This communication is based on two studies: a test of a framework for environmental statistics and the formulation of a framework for subnational area development.

The 1981 pilot project for the islands of the South Pacific consisted in the feasibility test of a conceptual framework for the organization of environmental statistics which was developed by the United Nations Statistical Office (UNSO). This project included fieldwork in Fiji to survey and to identify data availability and data needs by type of environmental subject. Data requirements are identified by subject areas. Existing data are tabulated to describe their format, quality, and usability. The entire exercise is based on a conceptual framework which links cycles of production, environmental media, and human welfare to categories describing environmental processes, impacts, and policy responses. The study demonstrated the desirability of the UNSO framework for environmental statistics and the technical feasibility to create statistical tables consistent with the framework.

But the actual adoption and implementation in a given country of a substantive framework for environmental statistics require also a study of its feasibility in terms of users' needs, capabilities, and development directions. There is thus a need to formulate a broader procedural framework, inclusive of the statistical element, addressing the organizational and institutional base of planning decisions and the nature of the human and natural ecological environments in which decision takes place.

A second study of planning approaches in Asia and the Pacific led to the identification of the importance of administrative decentralization and of the regionalization of the national plan. These efforts are realized in integrated area development (IAD). IAD is an alternative to top-down and bottom-up planning practices. The theoretical components of IAD focus on organizational structure, communication environment, spatial effects, and community dynamics. The emerging framework addresses to communication, information, organizational capacity building, and legislative mandate. IAD is a frame of reference within which an environmental statistics and communication system may evolve. The institutionalization process and the programme of action which is proposed to foster IAD recognizes the importance of intervillage information systems, decentralization at the local district level, coordination at the central level, and experimentation.

Findings emerging from the two studies are:

A framework for statistical data collection is of value in conceptualizing an environmental information system.

Certain tasks can be performed satisfactorily in information system development. They include creation of a scope or list of topics of environmental information requirements, survey of existing data file and data sets, and production of itemized tables and data description tables.

There are certain requirements and steps to consider before embarking on developing an information system for environmental statistics. Basically, (a) the administrative organizational setup, (b) the statistical information system, and (c) the scientific ecological monitoring of the environment, need to be linked in the conceptual and implementation process of environmental statistics data bases.

The fundamental problems of information system development are of a political-institutional nature and they are tied up with the particular development strategy in a given country and with users' data needs.

Programmes needed to foster IAD with its own information system at the local level include experimentation in community organizing and institutionalized participation.

The institutionalization of IAD can be achieved for given levels of resource constraints when decentralization and interorganizational coordination are implemented.

Emphasis is given to the use of existing indigenous and more formal communication networks, of locally managed needs assessment surveys and project impact monitoring, and of techniques and protocols for district level agreements among local and central levels and public and private actors.

THE 1981 PACIFIC ISLANDS PILOT PROJECT

Experimentation is needed with pilot projects which are not an adjunct to routine praxis, are not time bounded efforts, and are not unrelated to structural changes in the decision making process inherent in the IAD idea.

THE 1981 PACIFIC ISLANDS PILOT PROJECT ON ENVIRONMENTAL STATISTICS AND THE FIJI FIELD TEST 1/

The following paper is a summary of the 463-page report entitled Environmental Statistics Pilot Project: Pacific Islands Pilot Project; Final Report, October 30, 1981. 2/ This summary describes the application of the UNSO framework for the organization of environmental statistics and the Fiji field test conducted during 1981.

SUMMARY AND CONCLUSIONS

Genesis of the Project

The purpose of the Environmental Statistics Pacific Islands Pilot Project (PIPP) was to test the UNSO conceptual framework for the organization of environmental statistics.

The recommendation for a pilot project to test the suitability of the UNSO Draft Framework for the Organization of Environmental Statistics in a Pacific island setting was formulated at the October 1980 Pacific Workshop on Environment Statistics, sponsored by the UNSO, the Economic and Social Commission for Asia and the Pacific (ESCAP), and the East-West Center Environment and Policy Institute.

The participants from eleven Pacific countries agreed that one of the three pilot country studies to be undertaken worldwide should be conducted in the Pacific Islands region. They felt that much would be gained by addressing data about fragile islands ecosystems as a complement to the study of large continental masses. They also appreciated the opportunity to provide a Pacific Islands perspective in the International Environmental Programme of the United Nations.

The South Pacific Regional Environmental Programme (SPREP) assisted in the selection of Fiji as the host country for the field test. The 1981 South Pacific Commission 5th Regional Conference of Statisticians welcomed the intention to develop a set of standards for environmental statistics and recommended that the Pacific Islands countries support the pilot project.

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THE 1981 PACIFIC ISLANDS PILOT PROJECT

The pilot project was jointly funded by the UNSO, the Environment and Policy Institute, and the Pacific Islands Development Programme of the East-West Center and the Department of Urban and Regional Planning of the University of Hawaii.

The project was managed in the region with a majority of the project team from the Pacific region.

Project Description

The PIPP tested the proposed UNSO environmental scope and the structural elements of the UNSO conceptual framework. This testing considered economic, environmental, and social processes by describing stocks of resources, the impacts of these activities, and the subsequent policy responses. Environmental concerns and the UNSO framework were studied at the regional level for the Pacific Basin nations and at the national level for the Government of Fiji.

The project included two main phases (figure 10):

Phase I: The first phase, undertaken in two steps, was a general study of environmental problems in several Pacific Islands countries and was an application of the UNSO framework for the organization of environmental information.

(a) Problems common to the Pacific region, derived from ten island countries experts' questionnaire (Appendix A) and from a literature search, were consolidated in a detailed list of environmental problems in the Pacific Basin to be used as the "scope" for the collection of environmental statistics.

(b) The UNSO framework and the itemized tables for the organization of the description of environmental data were tested in a tabulation of six Pacific Islands country reports on the environment (Appendix B).

Phase II: The second phase, the Fiji Field Test, was a survey of information sources and available data in Fiji from the perspective of environmental analysis. It tested the feasibility of the use of the UNSO framework with a national environmental data base. The "Fiji Itemized Tables" (Appendix C), a statement of data quality, gaps and needs, and the "Fiji Environmental Statistics Study" tables (Appendix D), a computer application of the framework, were completed from data gathered during the survey of thirty-eight Fiji government ministries and statutory bodies.

In general, the framework was useful for the study of environmental processes and their impacts, and for monitoring of public and private responses. The format of the framework was found to be a powerful conceptual tool to identify and categorize environmental statistics, provided that data are monitored and collected in a specified manner.

The report recommends that a programme for the organization of environmental statistics should utilize three tasks which need to be integrated and phased: (a) development of a framework, scope, and guidelines for the organization of environmental information; (b) staged development of an environmental information system both "vertically" between the central and local level and "horizontally" across ministerial lines at various geographical or functional scales; and (c) development of scientifically tested procedures to monitor environmental problems and processes.

Applicability of the UNSO Framework in the Pacific

The experts' questionnaire and the literature search demonstrated the utility and flexibility of the framework, and furnished, along with the "scope" of environmental statistics, a relatively detailed reference list for common and unique problems in the Pacific.3/ The analysis of the questionnaire responses indicated that the framework was useful for the study of relationships, processes, and environmental impacts and for monitoring of public and private responses.

The flexibility and adaptability of the "scope" and the framework was borne out by the selection and incorporation of environmental statistics in the various categories of the "scope" without serious difficulties. The capability of the "scope" to allow entry of a variety of data without restriction can be considered an important aspect of the framework. The simplicity of the "scope" permitted elaboration of environmental problems and encouraged response from the experts. The survey and the literature search demonstrated that if information is collected for detailed problems according to the UNSO prescribed format, they then can be easily grouped together to allow for comparative analysis of more complex problem groupings. In essence, the simplicity of the "scope" of the framework inspired elaboration and orderly thought during the application of the framework, and generated a rather detailed list of environmental problems in the Pacific area.

Figure 10. Environmental statistics, Pacific Islands pilot project (1981)

Phase I: Pacific basin - research steps

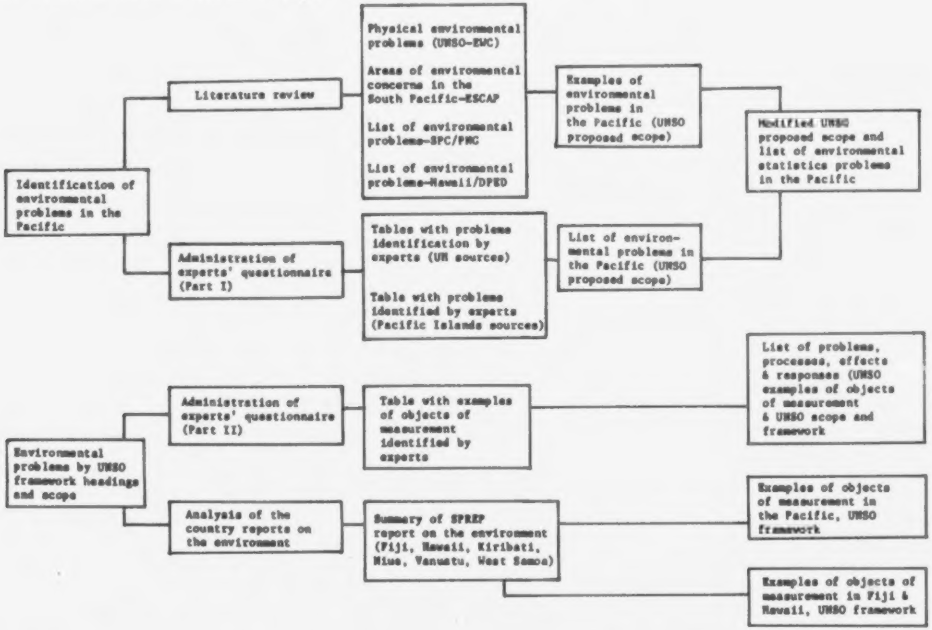
Identification of environmental problems in the Pacific
Literature review
Administration of experts' questionnaire (Part I)
Physical environmental problems (UNSO-EWC)
Areas of environmental concerns in the South Pacific-ESCAP
List of environmental problems-SPC/PMC
List of environmental problems-Hawaii/DPED
Tables with problems identification by experts (UN sources)
Table with problems identified by experts (Pacific Islands sources)
Examples of environmental problems in the Pacific (UNSO proposed scope)
List of environmental problems in the Pacific (UNSO proposed scope)
Modified UNSO proposed scope and list of environmental statistics problems in the Pacific
Environmental problems by UNSO framework headings and scope
Administration of experts' questionnaire (Part II)
Analysis of the country reports on the environment
Table with examples of objects of measurement identified by experts
Summary of SPREP report on the environment (Fiji, Hawaii, Kiribati, Niue, Vanuatu, West Samoa)
List of problems, processes, effects & responses (UNSO examples of objects of measurement & UNSO scope and framework
Examples of objects of measurement in the Pacific, UNSO framework
Examples of objects of measurement in Fiji & Hawaii, UNSO framework

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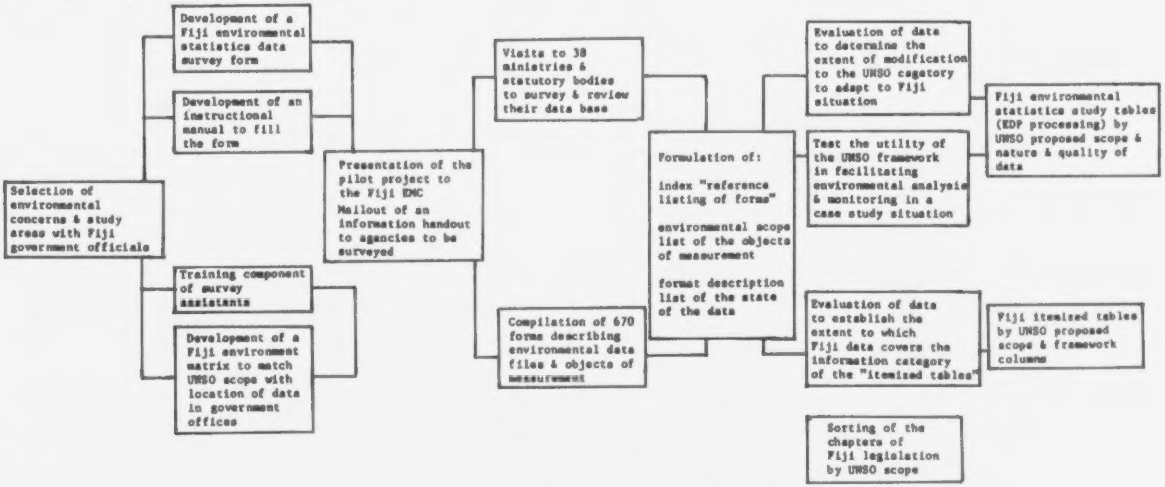
Figure 10. (continued) Environmental statistics, Pacific Islands pilot project (1981)

Phase II: Fiji field test - research steps


Development of a Fiji environmental statistics data survey form
Development of an instructional manual to fill the form
Selection of environmental concerns & study areas with Fiji government officials
Training component of survey assistants
Development of a Fiji environment matrix to match UNSO scope with location of data in government offices
Presentation of the pilot project to the Fiji EMC
Mailout of an information handout to agencies to be surveyed
Visits to 38 ministries & statutory bodies to survey & review their data base
Compilation of 670 forms describing environmental data files & objects of measurement
Formulation of:
index "reference listing of forms"
environmental scope list of the objects of measurement
format description list of the state of the data
Evaluation of data to determine the extent of modification to the UNSO cagetory to adapt to Fiji situation
Test the utility of the UNSO framework in facilitating environmental analysis & monitoring in a case study situation
Fiji environmental statistics study tables (EDP processing) by UNSO proposed scope & nature & quality of data
Evaluation of data to establish the extent to which Fiji data covers the information category of the "itemized tables"
Fiji itemized tables by UNSO proposed scope & framework columns
Sorting of the chapters of Fiji legislation by UNSO scope

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An important property of the structure of the framework is that its simple format and elements make it conducive to problem and process identification. It is relatively easy to categorize data and information in terms of environmental processes or background information, processes, impacts, and responses. In tabular form, it represents a concise means to synthesize extensive literature. The responses to Part II of the experts' questionnaire indicate that public officials or scientists, when familiar with an environmental problem, can easily answer by hypothesizing the causal relationships to be investigated. Another important point is that the framework can facilitate investigation and modelling of ecological processes. The dynamic nature of its media-stress approach offers a degree of interest for those involved in environmental management.

The conceptual framework proved useful in the Fiji field test for several reasons. The project provided Fiji with a description of its data bases cast in the context of an environmental situation and it demonstrated that a conceptual model could be applied in a practical manner. The "Fiji Itemized Tables" revealed data comparability, identified data gaps, and detailed data needs. The "Fiji Environmental Statistics Study" table proved that data could be collected along the lines of the framework, that its characteristics are useful for statistical analysis, that its format could facilitate modelling of environmental problems and processes, and that the table can be easily generated using a word processor and a computer.

The UNSO Framework and the Study of Environmental Problems in the Pacific

The scope and structure of the framework

The organization or the format of the proposed scope served as a satisfactory means to identify, sort, and categorize media of the environment (such as water and land). Environmental information, concerns, or problems can be distinguished using the structure of the framework, that is, basic information, processes, effects, and responses. The framework is useful because it is a concise representation of the ecological processes at work upon the media by stressor processes (such as hurricanes, deforestation, and pollution). It also serves as a means of alerting governments and agencies to the applicability and simplicity of the framework for studying environmental problems.

A detailed environmental scope in combination with a survey of existing environmental data can generate a set of itemized tables which describe in detail, for each element of the environmental scope and framework structure, the presence of environmental problems and extent to which man interferes in environmental processes.

Relationship with country environmental data and information systems

The use of the framework for generating a list of environmental problems for a nation or a region demonstrated that the framework could be used in identifying data needs. Government reports, synthesized in the framework tabular form, and itemized tables could be compared for the same items of the scope or derived topics to assess the availability of environmental data for a given set of problems. In this manner, the framework provided a reference for identification of gaps in the country data and information systems.

Suitability for environmental monitoring and management

A detailed environmental scope is a suitable reference for the synthesis of country laws and regulations. Tables can be generated to describe a country approach to the management of the environment. A detailed scope can be used to determine if a particular environmental problem falls within the area of inclusion and can be monitored and studied. In essence, the scope can serve to determine the adequacy of institutional and organized responses for environmental protection and management.

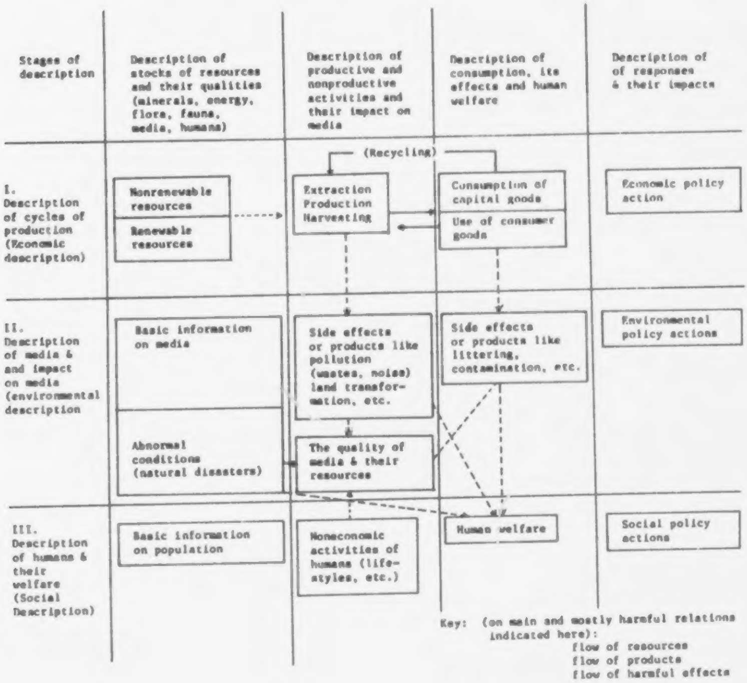
The PIPP demonstrated that data on environmental problems could be described in terms of their quality and usefulness. Tables could be generated to describe the nature and quality of data by using the media breakdown in rows and columns. Ultimately, these characteristics could be used to create statistical models for environmental management.

The framework does not "model" or represent ecosystems, but it can incorporate elements of an ecosystem and utilize information in a representative fashion to facilitate modelling of specific environmental concerns.

Findings on environmental surveys and system implementation

The UNSO framework (figure 11) was found to be a powerful conceptual tool for the organization of environmental statistics provided that:

Figure 11. A simplified analytical model for environmental statistics


Stages of description
Description of stocks of resources and their qualities (minerals, energy, flora, fauna, media, humans)
Description of productive and nonproductive activities and their impact on media
Description of consumption, its effects and human welfare
Description of of responses & their impacts
I. Description of cycles of production (Economic description)
Nonrenewable resources
Renewable resources
(Recycling)
Extraction Production Harvesting
Consumption of capital goods
Use of consumer goods
Economic policy action
II. Description of media & and impact on media (environmental description
Basic information on media
Abnormal conditions (natural disasters)
Side effects or products like pollution (wastes, noise) land transformation, etc.
The quality of media & their resources
Side effects or products like littering, contamination, etc.
Environmental policy actions
III. Description of humans & their welfare (Social Description)
Basic information on population
Noneconomic activities of humans (life-styles, etc.)
Human welfare
Social policy actions
Key: (on main and mostly harmful relations indicated here):
flow of resources
flow of products
flow of harmful effects

Source: UNSO, Towards Co-ordination of Environmental Data: A Draft Conceptual Framework for the Development and Organization of Environmental Statistics 2nd draft restricted (New York, 1980).

(a) data are collected in a manner able to describe cycles of production and consumption, media, impacts, human welfare, and policy responses;

(b) processes and environmental phenomena are monitored as they are manifested;

(c) data collection and categorization is performed according to their relationships;

(d) the use of the framework and data collection for a specific region is restricted to recognized environmental priorities of a given country in order to make optimum use of scarce human and technical resources;

(e) hierarchical and administrative organization and the flow of information between the various administrative levels and geographic jurisdictions within ministries are considered; and

(f) a survey of environmental information in a given country is carried out in a manner consistent with the management of its information system.

It is essential that one understands the ministry's legislative mandate in the area of environmental statistics; that data collection responsibilities of pertinent departments be determined and visits with officials be conducted to ascertain problems or areas of importance to the country: and that data sources be identified and copies of the format of data files (survey forms, registers, reports, and files) which contain objects of measurement be obtained. Data which is descriptive of villages, districts, provinces, and divisions are passed to higher levels of administration and often undergo harmonization. For this reason, an analysis of the recording instruments already in place is beneficial, because their improvements can be attained at little marginal cost.

Suggested Uses of the UNSO Framework in the Pacific Region

The PIPP concluded that a research step subsequent to the identification of environmental statistics and previous to the tabulation of the objects of measurements is recommended.

This step should include:

(a) understanding agencies' environmental legislative mandates;

(b) describing administrative structures;

(c) identifying the organizational setup for the collection and dissemination of information, "vertically" between the central and the local level and "horizontally" across ministerial lines at various geographical or functional scales;

(d) analysing of the recording instrument; and

(e) defining users' data needs.

This approach, proposed for future data collection, use, and development of the UNSO framework, is consistent with the one actually used in the Fiji field test. This pilot project has an interministerial data file available which could be analysed as outlined above and has already involved local officials in discussing possible ways to enhance environmental information gathering and monitoring.

The actual development of a programme for the organization of environmental statistics should utilize three integrated tasks:

(a) development of the environmental framework, scope, structure, and guidelines for classification, ordering, and processing;

(b) staged development of an environmental information system within a country with the active involvement of the public and private producers and users of environmental statistics at the national and local levels;

(c) development of scientifically tested procedures to monitor environmental problems and actual environmental processes to ensure that resources, stocks, and effects are properly accounted for in the framework.

NOTES

1/ Excerpt from The 1981 Pacific Islands Pilot Project on Environmental Statistics and the Fiji Field Test. A Summary Report, by Luciano Minerbi, Rodney Henning, and Roberto Quercia.

2/ Original copies of the report entitled Environmental Statistics Pilot Project: Pacific Island Pilot Project; Final Report, October 30, 1981, and the Fiji survey forms are available for inspection in the Fiji Bureau of Statistics Library. Copies of the report may be requested by writing to the United Nations Statistical Office: UNSO, New York, N.Y. 10017, U.S.A.

The proposed scope on environmental statistics "Adaptation of the Framework Revised UNSO Proposed Scope of Environmental Statistics Pacific Islands Problems," and related comments have been published in the UNSO publication: Statistical Office, Department of International Economic and Social Affairs, Survey of Environment Statistics: Frameworks, Approaches and Statistical Publications (Statistical paper; M 73) (New York, 1982), pp. 108-13.

A summary of the report will be published in the UNSO forthcoming publication Framework for Environment Statistics.

3/ See "Revised UNSO Scope of Environmental Statistics Pacific Islands Problems," p. 48.

THE 1981 PACIFIC ISLANDS PILOT PROJECT

NOTES ON INTEGRATED AREA DEVELOPMENT, COMMUNICATION, AND INFORMATION SYSTEMS 1/

BACKGROUND

The following notes are concerned with improving conventional planning activities to enable subnational (i.e., district or village) participation in the development process. They are addressed to Pacific Islands and Asian decision makers and planners who expressed interests in implementing development programmes in rural areas. For example, the problems of rural development in Pacific Island Nations (PINs) were the concern of a regional meeting held at the South Pacific Conference headquarters on 21-25 March 1983. A majority of the efforts to implement development programmes involved the decentralization of responsibilities and the establishment of new governmental organizations and/or the stimulation of existing rural institutions. Specifically, the Cook Islands and Fiji focused largely on rural dwellers, nongovernmental institutions, and the commercial sector; the Marshall Islands, Tuvalu, and Vanuatu have concentrated on the enactment of laws to establish local governments or island councils; Tonga has focused on a Rural Development Coordination Committee; Solomon Islands have created rural development centres, and Papua New Guinea has set up provincial governments.

In recognition of the problems encountered in national planning and the growing interest in decentralized planning efforts as indicated above, these notes explore the various elements and considerations in implementing integrated area development approaches.

These notes are organized in six sections (see table 2.1).

INTRODUCTION

Preamble: These notes recognize a number of distinct problems with top-down and bottom-up approaches to development planning because of the existence of distinct national development goals, priorities, and needs which remain unresolved in given national contexts.

Top-Down Planning

Characteristics: Top-down planning is currently used by most developing countries. It is characterized by central control over resources, political power, and processes of development, and a narrow perception of the term 'development'.

TABLE 2.1. NOTES ON INTEGRATED AREA DEVELOPMENT, COMMUNICATION, AND INFORMATION SYSTEMS

I. INTRODUCTION

A. PREAMBLE

B. TOP-DOWN APPROACHES

1. Characteristics: central control over resources, power, and processes; existence of distinct national development goals, priorities, and needs; narrow perception of definition of term "development."
2. Problems: different and distinct needs mean that collected data is inapplicable to other levels; lack of coordination results in duplication of efforts and inefficient management; and lack of understanding of local needs.
3. Effects: ill-designed projects; inappropriate technology; and plans made by "isolated, expert" planners and policymakers.

C. BOTTOM-UP APPROACHES

1. Characteristics: (ideally) self-determination reflected in distinct local needs, goals and perception of "development" and local control over power, resources, and process.
2. Problems: lack of organizational networks, skills, and ability to articulate interests to planners and decision makers; lack of control over important and necessary resources and lack of knowledge of external dynamics.

D. REGIONALIZATION OF THE NATIONAL PLANS: 1) Leads to many forms of decentralization, which include deconcentration, devolution, and transfer of functions to nongovernment organizations and 2) Case studies of other third world experiences which have successful components that could contribute to developing a notion of IAD (e.g., Roughan and Gaun Sallah models).

II. INTEGRATED AREA DEVELOPMENT

A. DEFINITION: to integrate the concerns and constraints of formal/informal organizations and central/local institutions within a planning process. As defined here it has the following characteristics: 1) Sectoral integration; 2) Integration of levels (geographic and functional); and horizontal and vertical considerations; and 3) Integration of phases of planning process. The ideal process is integrated from beginning to end in terms of self-monitoring, planning, and implementation.

B. GOAL: an intermediate approach to: 1) "accommodate bombardment" from above and below and within levels,

(TABLE 2.1 continued)

2) increase the effectiveness of development programmes (i.e., to achieve "meaningful" development through cooperative and collaborative efforts), and 3) increase effectiveness and efficiency of programmes.

C. OPERATING PRINCIPLES: Assumptions that reflect world view, statements of core set of values, and ideal states.
   1. Distinct Needs, Priorities, and Objectives (i.e., recognition of the existence at all levels and across departments, ministries, and agencies within all levels);
   2. Relative Definition of "Development" (i.e., can be defined according to distinct sociocultural histories and distinct needs of respective actors).
   3. Self-Determination;
   4. Community Participation;
   5. Cooperation and Coordination;
   6. Efficiency and Equity Considerations; and
   7. Decentralization.

III. CONCEPTUAL FRAMEWORK

A. THEORETICAL COMPONENTS: focus on organizational structures, communication environment, and constraints to communication; spatial effects; and the dynamics of communities.

B. REQUIREMENTS:
   1. Communication: horizontal, vertical, and integrated; cooperation and coordination; timeliness of communication; appropriate technology/infrastructure; institutional infrastructure (e.g., telephone/computer/telecommunication); structural messages; and feedback mechanisms for monitoring and evaluation (e.g., policy for open horizontal and vertical integration of data/communication which would include considerations of privacy, equity, and other social issues).
   2. Information/Data Requirements: approaches (i.e., accounting, media, stress, and ecological); description of economic resources, environmental, and social/welfare institutions; framework; indices; sources; needs (i.e., village, national, and project IAD); and structural messages.
   3. Organizational Capacity Building: education, consciousness raising, self-awareness; participation; training in organizational/management skills; flexibility in agency (learning process approach); and an institutional/sectoral mandate.

(TABLE 2.1 continued)

4. Mandate: mechanisms for communication, cooperation, and enforcement must be promulgated from the central government to the legislature on an information/communication policy for relevant agencies to implement at various administrative levels.

IV. INSTITUTIONALIZATION

A. APPROACH: The institutionalization of IAD is dependent upon certain structural changes in existing planning and decision making processes.
B. CONSTRAINTS: How to handle problems with personnel, funding, materials, and time.
C. INTERORGANIZATIONAL COOPERATION AND COORDINATION: Communication mechanisms and organizational/interorganizational linkages.

V. DEVELOPMENT OF TOOLS AND TECHNIQUES FOR IMPLEMENTING IAD

A. COMMUNICATION: Flows and networks; alternative mechanisms; and communication hardware infrastructure.
B. INFORMATION: Agreement techniques; indicators; and information networks and survey instruments.
C. ORGANIZATIONAL CAPACITY BUILDING: Structural patterns; interorganizational linkages; needs assessments; change processes; and educational methods and techniques.
D. LIMITATION OF PILOT PROJECTS
E. GUIDELINES FOR PILOT PROJECTS: Outside resources; village participation; district level responsibility; local level needs; and integration into the budgeting process.
F. EXPERIMENTATION: Experience in community organizing which leads to self-determination attitudes via institutionalized participation, mobilization of local or district resources, information and survey techniques, two-way information/communication flows, and training tools.
G. PROCESS TOOLS: Congruence analysis of typologies of projects with typologies of villages or districts; evaluation techniques; and organizational skill building techniques.

VI. PROGRAMME OF ACTION

A. Review of the eight main themes of the paper and recommendations for implementation.

Problems: Distinct problems of this form of planning arise during the development process. These include different and distinct unfulfilled needs at different levels; the collection of data by one level of government which is inapplicable to other levels; local data being lost in the process of aggregation and communication on the way up; lack of coordination which results in duplication of efforts and inefficient management; and a poor understanding of local needs and undesirable local impacts.

Effects: The net effect of this planning approach is that it results in ill-designed projects, inappropriate technology, and plans completed without a true understanding of local needs and having undesirable local impacts.

Bottom-Up Planning

Characteristics: Bottom-up planning is characterized by local self-determination which is reflected in the expression of distinct local needs, goals, and perceptions of development and control over local political power, resources, and processes.

Problems: A number of problems have led to little acceptance of this approach in development planning. These include: limited skills and ability to articulate the local interests to decision makers; lack of control over important resources; lack of organizational and institutional networks; lack of knowledge of external dynamics; resentment of outsiders; and the inherent conflict of interest with the established elite.

Regionalization of National Plans

The problem faced by many developing country national planners is the regionalization of national plans which implicitly leads to decentralization. Decentralization can take more than one form: (a) deconcentration of functions to district offices within the same ministerial line; (b) devolution of central government functions to local governments; and (c) the transfer of functions to nongovernmental organizations (NGO). The realization of the need to decentralize planning emerged when governments recognized that the previous process resulted in an inequitable distribution of benefits, social instability, and failures of central bureaucracies to foster genuine development at the local level. The generalization of planning objectives, standardization of implementation procedures, and inappropriate evaluation and monitoring criteria for regions are common practices. Variations of community problems, diversity in the geographical conditions of the regions, the multiethnicity of the population, resentment of outsiders, and availability of local resources have been largely overlooked by the national planners.

Case studies from the third world of successful planning experiences show potential for more integrated and decentralized approaches. For example, in Indonesia, the National Development Planning Board started to emphasize the regionalization of the development plan in the Second Five-Year Development Plan, by constituting Regional Development Coordination Boards and Provincial Development Planning Organizations in each province. By the next Five-Year Development Plan, planners recognized a significant increase in more equitable regional development. The mobilization of untapped local resources and participation of the local community have shown to be considerably advantageous in most parts of the country. Several components of such experiences could be combined into a broader framework for more integrated planning approaches.

INTEGRATED AREA DEVELOPMENT

Definition: The failure of top-down and bottom-up approaches results from not integrating the concerns and constraints of formal/informal organizations and central/local institutions within an integrated planning process. Integrated area development (IAD) has emerged in development planning as one way to improve the effectiveness of programmes given the dual realities of national and local priorities. Although IAD can be equated with the concept of horizontal integration, it is used to describe an approach with much broader applications. IAD, as defined here, has the following characteristics:

(a) Sectoral programme objectives are integrated reflecting the interdependence of social and economic factors in development;

(b) There is integration of planning activities and programmes among and within various administrative/geographic levels, and across functional agencies at various levels; and

(c) There is integration of objectives and actions of various actors in the phasing of planning and projects from start to finish. The ideal would be a self-monitoring and adjusting planning and implementation process.

Goals: There are three major goals or net effects with the integrated area development approach as used in this paper. These include: accommodation of the "bombardment" of pressures and actions from above, below, and within all levels; achievement of development through cooperative and collaborative efforts; and an increase of the effectiveness and efficiency of development programmes and projects.

Operating principles: The framework for integrated area development has been approached from the perspective that development or development planning inevitably succeeds only when it brings about quantitative and qualitative improvements in the social welfare of a population. This means that the realization of effective programmes and projects will depend on how they reflect and respond to the needs and desires of the population as well as those of decision makers. If IAD is to succeed here where other approaches have failed, there must be acknowledgement among actors of several elements which are critical to making IAD work/operational. These elements, presented as operating principles, are interdependent -- to neglect or ignore one element jeopardizes successful/effective outcomes of programmes or projects.

The basic operating principles underlying IAD are as follows:

(a) Recognition of the existence of distinct needs, priorities, and objectives among people and private and government organizations at and between each level of decision making and community life;

(b) Acceptance of relative definitions of "development" since the concept is derived from and is as diverse as the needs, desires, and unique sociocultural histories of respective actors and communities;

(c) Recognition of and support for self-determination at the local level, since it is the local actors who possess the knowledge best suited to guiding their own development;

(d) Community participation to train and involve local people and decision makers as coequals in the determination of the development process;

(e) Willingness and commitment to cooperate and coordinate actors and levels so that equal access to and participation in the development process is assured;

(f) Balancing of efficiency and equity considerations in development; and

(g) Adoption of strategies to decentralize administrative and budgetary responsibilities for development

> and development planning to decision making bodies at the local level. This would increase the need for the coordination and exchange of information and resources among parties and levels; however, decentralization is clearly the most viable means to implementing an approach which strives for greater fit between development objectives and local conditions and needs -- and ultimately, self-determination.

CONCEPTUAL FRAMEWORK

Theoretical components: While no single framework of integrated area development exists, any framework (because the concept centres on interorganizational programmes for change or betterment) will have to include components of organization theory, communication theory, change theory, planning theory, and spatial planning theory.

The primary concerns of any conceptual model of IAD should focus on:

(a) The organizational structures and dynamics of institutional settings;

(b) The communication environment and constraints on communication (i.e., communication, both formal and informal, and information links and processes);

(c) The spatial effects of planning and equitable distribution of benefits (i.e., spatial dynamics and the outcomes of spatial dynamics); and

(d) The dynamic of individual communities that influences the selection of change strategies.

Requirements: Since there are unique problems encountered in the development of an integrated planning approach for a particular setting, only those elements which seem to have been critical to the success or failure of planning experiences in the field will be discussed. The four major elements for the effective implementation of integrated area development are: communication, information and data sources, organizational capacity, and mandate.

Communication

Assumptions: If IAD is to work, adequate and effective two-way communication among each sector and across each level is imperative. All actors must be able to submit their input and effectively access other inputs throughout each phase of a project or programme. These proceed from the following assumptions: A. Information is a form of power; the kind of information determines the mode of communication used. B. Free exchange of information represents equalization of access to power. C. The structure of communication in a society "is homologous to its decision making structure," in that designing equal access to power requires a reorganization of the communication structure and information flow. D. Information must be able to flow freely.

Infrastructure: This two-way propagation of information or open communication imperative requires an adequate and reliable communication hardware infrastructure which simultaneously can be operated and maintained within a society's financial and technical resources. Utmost caution must be given not only to the idea that access to information be fully enabled, but that the communication infrastructure not be misused as a vehicle for manipulating rural communities into accepting outside interests and programmes.

Coordination/cooperation: Enabling the free exchange of information, data, and ideas demands cooperation and coordination among the various sectors and levels. Organizational coordination can be attempted through the establishment of a central coordinating body with formal authority; through selection of a leading line agency on a rotative basis; or through various negotiated agreements without the use of formal coordinating central or lead agencies.

Policy issues and criteria: Open communication must be recognized as essential. A formal policy for establishing the guidelines for realizing this objective and for dealing with potential threats to privacy and to traditional values — is considered a necessity.

The policy must also address the issue of what types of data must be collected, and indeed, the general importance of data collection itself. The types of data to be collected and communicated is an important issue. The nature of the data is also important. Data, of course, must be current and reliable. Perhaps equally important, and perhaps more so within the context of IAD, is the requirement that collected data be relevant and useful to each actor in each sector and level. In addition, the data must also be timely to be accessed when needed.

Insuring full participation in data determination, collection, and analysis is an effective strategy in meeting the criteria for relevancy and usefulness of data. Full participation fosters increased awareness of the diversities of information needs, facilitates general data collection objectives, and promotes better relations directly and indirectly. A third important requirement, is that the data collected for administrative purposes must be standardized in a manner or format which meets the criteria of relevancy and usefulness to all actors at all levels.

Information

Approaches: Four general approaches to data collection are recognized: accounting, media, stress, and ecological. Much of the existing data collected by the central level in developing countries follows the accounting approach (e.g., agricultural censuses, population censuses, and household and expenditure income surveys). The eventual goal is to establish a Social Accounting Matrix. However, one of the often stated goals in developing countries is that of "decentralization." Accounting approaches, developed for top-down decision making, must be redesigned to allow for data aggregation at the local level to allow decentralized local area planning. If a decentralization policy is implemented, a suitable approach might be a media-stress and ecological approach because it would include a systematic monitoring of man-made and natural processes and their impact on human and natural ecosystems at a local ecological and geographical scale. This has been recommended by several intergovernmental organizations.

Types of data: Consideration pertaining to the framework for data collection should also be taken into account. Data collected by the district level can be classified into three main categories. These are: (a) economic resources; (b) environmental resources; and (c) institutional and social resources. These data can be described in various stages to identify flows and interactions. For example, the stages might progress from a description of stocks to productive and non-productive activities, to consumption, and to a description of structural messages (laws, institutional arrangements, and technology) which are needed to implement change.

Data collection methods: Methods to be utilized in data collection should depend upon the research unit (e.g., extension agent) and the research topic (e.g., agricultural productivity). Methods for data collection include in-depth interviews, standard questionnaire interviews, participants' direct observation, group discussion, record keeping by respondents, and physical measurements.

District information centres: Monitoring and evaluation units could be established at the district level to collect and analyse data. These units would be responsible for collecting information in a format which would enable the top level to develop a typology of districts and their needs. In addition, the evaluation unit should develop the district data base to ensure the effective monitoring of development projects.

If units were set up at the district level, the following benefits would be expected to occur: (a) development of regional standards for data collection and monitoring; (b) development of national and local expertise in data collection along with the development of a manpower training programme; (3) long-term prospects would be looked at in terms of their priority for development (a project ranking process); and (d) monitoring and evaluation would be closer to the decision making process (assuming a decentralization process were implemented down to the district level).

Organizational Capacity Building

Planning for community development is axiomatically participatory. Historically, however, the base of participation in development planning has changed from a small informal elite to a formal broad base of constituents. The aims of citizen participation have also changed. Citizens now at least can serve three functions in development planning:

(a) to serve as a constituency of support for the planning agency and its activities;

(b) to serve as a means of wisdom and knowledge in the development of a plan and in identifying the mission of the planning agency; and

(c) to act as a watchdog over one's own as well as others' right in the design and delivery of development policies.

To enable local communities to take an active role in the planning process, they must be given opportunities to exercise and learn how to plan their own development. However, there is some prerequisites for managing their own development:

(a) social consciousness and community awareness for their problems, strengths, and potential resources;

(b) active and positive social interaction in which they can share feelings, ideas, opinions, and knowledge;

(c) appropriate technical know-how; and

(d) social organization, to organize and coordinate community efforts and actions.

A general education programme for the community is definitely appropriate; however, training and learning opportunities that directly increase community skills and competencies to manage development is considered to be a better choice. To provide these learning opportunities, the organizations that serve the community must display a high degree of flexibility and a willingness to embrace error for the sake of community capacity building.

Mandate

A legislative mandate to establish a communication and information planning policy is needed to legitimize and mobilize resources to implement IAD and establish rules for interagency data exchange and data management responsibilities. The improvement of planning for local area interests will require overcoming cultural and institutional or structural barriers which frustrate efforts to integrate programmes, increase communication, and transfer planning and decision making responsibilities to the people at the local level. For this reason, it is important that a legislative and administrative mandate be established to institutionalize strategies for integrated development planning.

Conventional administrative operations pose problems for implementing an approach which must be comprehensive, yet flexible in planning and monitoring programmes. Development activities are generally assigned to discrete agencies and segmented into functional programmes which tend to be vertically controlled but not integrated at the local area level. This creates numerous problems which should be mitigated through legislative or administrative means: i.e., the lack of communication and coordination among agencies and within agencies on information and programme plans for a particular area; the reluctance and lack of incentives for staff to allocate time and effort to coordinate and integrate programmes; the lack of legitimacy for the use of integrative, decentralized processes; the absence of a unified programme or overall direction for local area development; and the lack of information and communication policies for relevant agencies to implement at various administrative levels.

INSTITUTIONALIZATION

General approach: The institutionalization of IAD is dependent upon certain structural changes in existing planning and decision making processes. Foremost is the need to devise long-term strategies which would allow for the decentralization of authority and joint responsibility for planning from the national level to district and village levels. This would require that mechanisms be found to link the objectives and priorities of each level with those of the others. To ensure that this occurs, there must be a mandate for and a commitment of personnel and funds to implement these changes in process and focus. There are two major problems which undermine the effectiveness of IAD. They are: (a) resource constraints; and (b) lack of interorganizational cooperation and coordination in the monitoring and implementation of programmes.

Resource constraints: Ways must be found to overcome the problems of lack of personnel, skills, funding, materials, or time which could hinder the capacity at the district or village level to participate as a partner in the development process.

Preliminary evidence[2] seems to suggest that a district level data base/statistical collection/analysis unit as described above might not be as expensive as previously perceived. However, data is spotty at best and further research needs to be undertaken in this area. In terms of hardware, the costs are going down. In the area of village mobilization of resources, the educational component for "development trusts" (e.g., Solomon Islands) involved training a team of nine to twelve people in five "people" centres in five provinces for the operation and establishment of village centres. The village centre concept is a strategy for village resources mobilization and an enabling active participation. The FAO study suggests that village-level statistics can be effectively collected through the mobilization of village resources and through a training programme for village-level statisticians. These statisticians would then work on a voluntary basis once the needs for self-awareness are recognized.

Interorganizational coordination: This will require agreement among participants on programme objectives and how programmes will be implemented. It will also require constant communication and feedback among participants throughout the development project or process. Procedures and mechanisms for ensuring that these requirements are met will have to be created and institutionalized.

DEVELOPMENT OF TOOLS AND TECHNIQUES FOR IMPLEMENTING IAD

Communication: Action in this area should focus on developing ways to utilize existing (indigenous and more formal) networks, and identifying those parts of the communication environment which need to be enhanced or which pose barriers to project success. This will entail:

(a) Surveying the types and flow of information used in decision making at various levels and how this information is communicated within indigenous networks;

(b) Surveying and developing alternative mechanisms for the coordination of communication for IAD; and

(c) Developing an adequate and reliable communication hardware infrastructure.

Information: For effective data collection, the participants need to share a common language with which to plan and act. The information must reflect participants' needs and should be accessible to participants. Further action must be taken to:

(a) Identify ways to come to agreement on the type of information being used for planning purposes, e.g., the Gaun Sallah technique being experimented in Nepal;

(b) Develop integrated development indicators such as those being used by Roughan in the Solomon Islands; and

(c) Develop information frameworks and survey/collection instruments.

Organizational capacity building: Action in this area should focus on ways to enable local villagers to participate fully in the planning process. They must be given the resources and opportunity to mobilize and build strength. First, the institutional disposition of the planning setting must be understood (i.e., the barriers and potentials for village development as locally defined). In addition, they must be able to respond to change processes. This will require:

(a) Surveying, identifying, and analysing structural patterns and barriers to social change, as exemplified by the Rural Development Inventory developed by Young;3/

(b) Surveying and analysing interorganizational linkages as well as researching and testing ways to increase interorganizational coordination;

(c) Performing needs assessments within the village and district levels, to determine programme fit and resource requirements;

(d) Systematically accumulating and analysing the impacts of projects within project boundaries over time to determine coping mechanisms for planned or unplanned change; and

(e) Development of educational methods and techniques from the above information.

Limitation of pilot projects: Although pilot projects offer an intermediate solution for instituting alternative planning approaches, they should not be relied upon for implementing IAD. Pilot projects inherently do not provide the conditions for effective IAD for the following reasons: (a) they are not conducted under normal planning conditions but as an adjunct to the existing planning process; therefore, they do not take into account the real resource and organizational constraints or existing development potentials; (b) since they are discrete, time-bounded phenomena, it is difficult to create and sustain a learning and capacity-building environment crucial to integrated area development; and (c) they tend to absolve development planners and decision makers from having to integrate alternative approaches into their normal operating budgets and procedures.

Guidelines for pilot projects: When conditions dictate that pilot projects be used, the following guidelines will help to mitigate some of the problems usually encountered:

(a) Utilize minimal outside resources to avoid overdependency and promote developmental self-confidence;

(b) Formulate project and evaluative criteria with those who have a part in the project or are likely to be impacted by it, e.g., villagers;

(c) Ensure that the design, implementation, and monitoring of projects will be the responsibility of the district level;

(d) Focus on projects which must address national and district priorities but are centred at the local level; and

(e) Attempt to develop projects which are integrated into the routine budgeting process to avoid discontinuation of the projects at a later stage of development.

Experimentation: While none of the above remarks are new, they suggest that the conventional planning process -- whether centralized or decentralized -- must undergo change in order to respond to the need for greater integration in programmes.

This will require that governments and planners begin to test alternative planning methods to determine which tools and mechanisms are most useful for their individual settings. Successful experiences with alternative techniques lay the foundation for broader institutional change in the planning process.

Experimentation needs to be directed toward building experience in community organizing as a requisite for community participation — the successes of which would lead to:

(a) Establishing procedures and/or mechanisms for institutionalized participation;

(b) The mobilization of local or district resources to plan and implement programmes and projects;

(c) Developing and using information and survey instruments that work to the satisfaction of all participants;

(d) Maintaining two-way communication/information flows among planning levels and participants;

(e) Developing and using tools to educate and train participants at the national, district, and local levels; and

(f) Developing self-determination attitudes and self-propelling personal growth opportunities, and creating motivation for development.

Process tools: Some effort must be given to exploring the problems of establishing common action frameworks for the participants in the development planning process. Work must be done to construct models for consensual tools for IAD, such as the following:

(a) Creating typologies of development projects, and typologies of villages and/or districts under different development exposure (isolated under minor or major pressures) with guidelines to match them for congruence and appropriateness;

(b) Utilizing evaluation techniques as an integral part of the implementation process, to be used by all participants;

(c) Developing and experimenting with organizational skill-building techniques and self-management tools (i.e., training methods for the development of local expertise).

Concerted efforts should be made to test, utilize, and/or adapt techniques and methodologies developed in other planning settings: for example, implementing the Rural Development Inventory at district levels and encouraging the broader use of village-level participatory methodologies like the Gaun Sallah or Roughan models.

PROGRAMME OF ACTION

The following is an abbreviated list of recommendations for changes in the planning approach, which focus on building the capacity of district-level planners as well as communities to initiate and manage the development process:

1. Collaboration of villagers with national and district planners to develop instruments for use in national and district-level planning;

2. Creation and maintenance of a data bank shared by national and district levels, which allows parties at various levels to access information in a form that is suited to their purposes;

3. Institutionalizing evaluation procedures for all phases in the process of planning and implementation for which each level's responsibilities are defined (this would allow each level to monitor each other's activities). One mechanism for doing this is to establish a research and evaluation unit at the district level;

4. Establishing ways to arrive at consensually-derived development programmes -- this may take the form of negotiated development agreements which would also serve as evaluation and monitoring devices;

5. Development of training capabilities for both rural residents and the trainers themselves. Specifically, an education/training unit should be established at the district level (with counterpart components at each level) to educate:

   (a) national and district-level planners and decision makers in the use of these participatory, decentralized techniques;

   (b) communities to mobilize their own resources and strengthen their capacities to articulate their needs and enable them to deal with other levels; and

   (c) village statisticians.

One suggested training method is the "cross-fertilization" technique being used in Indonesia, where project villages are trained by villagers from successful projects. Specifically, this is where a group of people who engage in village community work is given an opportunity to visit and discuss with people from successful projects. This approach is considered to be a successful dissemination technique for transferring locally appropriate technology among villagers.

6. Restructuring national expenditure planning to pass responsibility to the district level. Funds provided to districts could enable the building of administrative capacity for self-reliant development.

7. Establishing institutional mechanisms to stimulate nongovernmental organizations and deal with external aid donors (e.g., "development trusts" to act as intermediaries in the local development process). A major part of this process would be an inventory of existing institutions in the rural areas (both governmental and nongovernmental). As institutions are assumed to be one of the major building blocks in society, the mobilization of the rural population could be accomplished through these mechanisms.

8. Reorganization and the determination of new roles for governmental institutions both at the central and local levels when implementing decentralization should be investigated (such as with the case of Papua New Guinea).

NOTES

1/ Prepared by Gregory P. Barbour, Vince M. Diaz, Ruby M. Edwards, and Poedjo Poerwanto.

2/ See Food and Agriculture Organization of the United Nations, Regional Office for Asia and the Pacific, Training Manual on Village Level Statistics (Bangkok, 1981); and Frank Young, Rural Development Inventory, Parts I and II (Honolulu: Technology and Development Institute, East-West Center, 1975).

3/ See Young, Rural Development Inventory, Parts I and II.

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APPENDIX A. PACIFIC ISLANDS ENVIRONMENTAL PROBLEMS
PART II - EXPERTS' QUESTIONNAIRE

COASTAL LAND USE PROBLEMS AND REEF MANAGEMENT PROBLEMS

May 15, 1981

SELECTED ENVIRONMENTAL PROBLEMS	BASIC INFORMATION NEEDED	EFFECTS ON HUMAN WELFARE TO BE INVESTIGATED	EFFECTS ON THE PHYSICAL & NATURAL ENVIRONMENTS	TYPE OF POLICY RESPONSES TO BE STUDIED
Natural resources (coastal & deep sea fisheries land products)	Stocks & availability of production estimated	Availability of increased exportation or consumption	Eventual areas of actual use of resources	-----------
Continuous disposal of waste from fruit canning factory near sea on Rarotonga	Degree of destruction of the marine life	Production cycle of detrimental effect of dangerous chemicals released by the factory	Destroys wildlife/ marine life; strong unpleasant smell from decomposed waste products	Devise or formulate pollution control programme & conservation policy for controlling problem
New land use of coastal areas, i.e., real estate mining, & recreation	What is happening to biological & physical environment of the coastal area	Effects on traditional use of area by local population	Effects on flora & fauna as well as physical, i.e., sand versus mining	Legislation for controlled use of coast & alternative resources to be found to meet current needs

APPENDIX B. COUNTRY REPORTS ON THE ENVIRONMENT
EXAMPLES OF OBJECTS OF MEASUREMENT

EXAMPLES OF OBJECTS OF MEASUREMENT
FOR COASTAL LAND USE PROBLEMS & REEF MANAGEMENT PROBLEMS
DERIVED FROM HAWAII ENVIRONMENTAL REPORT & FIJI COUNTRY REPORT

(Source key: F=Fiji; H=Hawaii)

Basic Information	Processes	Harmful Effects	Policy Responses
-[Habitat areas]	-Collection of live reef-building organisms (F) -Reef blasting (F)		
-Shoreline (H)	-Tourism use of shoreline (H) -Urban development (H) -Restriction, loss of access (H)	-Altered character of areas (H) -Excluded use to residents (H) -Alienation of residents (H) -Loss of visual use (H) -Inadequate beach front and parks (H)	
	-Severe overloading on Oahu(H) -Tourists occupy 26% of use (H)	-Limited beach area (H) -Conflict between tourists and residents (H)	-Exercise overall conservation ethic (H) -Strive for compatible relationships between land and water-based activities (H)
	-Land development (H)	-Drainage (H) -Siltation (H) -Pollution (H) -Destruction to: -Sand dunes -Wetlands (H) -Loss of open space (H)	-Encourage shoreline use for recreational, educational and/or scientific use (H)
	-Construction of artificial structures (jetties, breakwater) (H)	-Modification of circulation and currents (H) -Erosion of beaches (H) -Surfing sites ruined (H)	-Promote a shoreline development plan to curb shoreline erosion from either natural or man-made causes (H)
	-Quarrying of rock (H)	-Modification of shoreline (H)	-Monitor coastal water quality programs after they are implemented (H)
	-Disposal of scrap, garbage, trash(H)	-Dangerous conditions (H) -Unsightly views (H) -Contamination (H)	
	-Determination of desired shoreline utilization (H)	-Conflicts over use, for recreational and open space (H)	
	-Non-point sources can continue to pollute coastal waters (H)		-Allocation of resources for control of non-point sources (H)

APPENDIX C. FIJI ITEMIZED TABLES

3.2.2.1.3.5: AGRICULTURE (including livestock)

Agriculture is an economic activity and the row I of the analytical model (cycles of production) is a natural starting point for statistical description. Possible harmful effects associated with agricultural production and consumption on the environment and on human welfare are also treated.

BASIC INFORMATION

-Number, size of farms

(AGFM/EPS 10. D.F. Number of farms, farming households, farm population and comparisons with population census. E.g. of classification)
(AGFM/EPS 14. O.M. Area measurement of farms and fields)
(AGFM/EPS 25. O.M. Number of farms by number of farming households on farm)
(AGFM/EPS 26. D.F. Number of farms, farming households & population by age, sex and working status)
(AGFM/EPS 29. O.M. Number of sample farms)

-Distribution & type of cultivated area

(AGFM/RD 6. D.F. Land use Viti Levu)

(AGFM/EPS 3. O.M. Dalo area yield and production, example of rootcrop)
(AGFM/EPS 4. O.M. Reported acreage and production of crops grown for sale. Selected rootcrops and all treecrops in field)
(AGFM/EPS 6. O.M. Area under cultivation of tropical vegetables [ha.])
(AGFM/EPS 7. O.M. All rice area and production by irrigated/rainfed season, 1978. E.g. of cereal crop)
(AGFM/EPS 9. O.M. Area and number of farms cultivating main season rice, 1978. E.g. cereal crops)
(AGFM/EPS 11. O.M. Area under cultivation of coconut, 1978. Example of treecrop)
(AGFM/EPS 13. O.M. Area under cultivation of principal crops by division [hectares])
(AGFM/EPS 15. O.M. Rootcrops, cereals, pulses, nuts of oil seeds, vegetables and other vegetables [describes all crops] - part A)
(AGFM/EPS 15. O.M. Rootcrops, cereals, pulses, nuts of oil seeds, vegetables and other vegetables [indicates land tenure] - part B)
(AGFM/EPS 16. O.M. Cassava estimated area and standard error)
(AGFM/EPS 31. O.M. Area under cultivation of sugar cane [ha.])
(AGFM/EPS 32. O.M. Area under cultivation: dalo, e.g. of rootcrops)
(AGFM/EPS 35. O.M. Root crops, cereals, treecrops, pulses, nuts & oil seeds, vegetables and other vegetables)

(AGFM/EX 8. O.M. Sugar cane, copra, rice, beef, goat, production value to producers, by product, in million dollars)
(AGFM/EX 9. O.M. Production of coconuts, cocoa, citrus fruits)

APPENDIX D. UNITED NATIONS STATISTICAL OFFICE
FIJI ENVIRONMENTAL STATISTICAL STUDY

UNSO SCOPE	OBJECT OF MEASUREMENT	PERIODICITY TIME COLL	PERIODICITY TIME PUB	PERIODICITY DATE COLL	PERIODICITY DATE PUB	AVAIL-ABIL-ITY	COVERAGE POL H	COVERAGE UNIT L	QUALITY STATE OF DATA	METHOD OF COL-LECTION	SOURCE: REPORTING UNIT	FILE: MINISTRY RECORD
HARVESTING	SQUID	O	A	80	80	OP	N		A	RS	11	AFGM 05
HARVESTING	COMMERCIAL TUNA	O	A	80	80	OP	N		T	RQ	11	AFGM 08
HARVESTING	EELS	O	A	80	80	OP	N		A	RS	11	AFGM 06
HARVESTING	BECH-DE-MER	Q	A	80	80	OP	N	DV	D	RQ	09	AFGM 01
STOCKS												
BACKGROUND INFORMATION												
OBSERVATION	FISH	O		78		ON	N		A		11	AFGM 13
IMPACT												
DEPLETION(DERRIS POISON)	FISH	O		78		ON	N		A		11	AFGM 13
DEPLETION(DYNAMITING)	FISH	O		78		ON	N		A		11	AFGM 13
RESEARCH (HARVESTING)	FISH	O		78		ON	N		A		11	AFGM 13
SERVICES												
IMPACT												
DEPLETION	FISH SPECIES	M	M	80	80	ON	N	I	D	RS	09	AFGM 17
POLLUTION												
QUALITY												
RESPONSES												
MONITORING	MINERAL	O	O			ON	N		T	I	25	RS 15

(APPENDIX D continued)

UNSO SCOPE	OBJECT OF MEASUREMENT	PERIODICITY				AVAIL-ABIL-ITY	COVERAGE		QUALITY STATE OF DATA	METHOD OF COL-LECTION	SOURCE: REPORTING UNIT	FILE: MINISTRY RECORD
		TIME COLL	TIME PUB	DATE COLL	DATE PUB		POL H	UNIT L				
C. LAND & SOIL												
AGRICULTURE												
PROCESSES												
IRRIGATION	SUGARCANE LANDS	A	A	80	81		N	DS	A	RQ	25	DID 01
CROPS												
BACKGROUND INFORMATION												
OBSERVATION	DALO	D	D	78	81		DV		T	P	13	EPS 15
PROCESSES												
CULTIVATION	COCONUT	D	D	78	81		DV	P	A	P	13	EPS 11
CULTIVATION	MAIZE	D	D	77	81		N	M	A	P	13	EPS 01
CULTIVATION	TROPICAL CROPS	D	D	78	81		DV	P	A	P	13	EPS 13
CULTIVATION	PULSES, NUTS, etc	D	D	78	81		DV		T	P	13	EPS 15
CULTIVATION	RICE FARMS	D	D	78	81		DV	P	A	P	13	EPS 09
CULTIVATION	SUGAR	D	D	78	81		N	P	D	P	13	EPS 33
CULTIVATION	CASAVA	D	D	78	81		DV	P	A	P	13	EPS 16
CULTIVATION	COCOA	Q	A	80	81	ON	DV	DS	A	I	25	EX 17
CULTIVATION	TROPICAL VEG	D	D	78	81		DV	P	A	P	13	EPS 06
CULTIVATION	FRUITS & VEG	A	A	80	80		DV		T	S	13	EX 02
HARVESTING	DALO	A	A	77	81		DV	M	A	P	13	EPS 03
HARVESTING	COCOA	A	A	80	81	OP	DV		A	S	13	EX 09
HARVESTING	TREECROPS	D	D	78	81		DV	M	D	P	13	EPS 05
PRODUCTION	COPRA	A	A	80	81	OP	DV	E	T	S	13	EX 08
PRODUCTION	SUGARCANE	A	A	80	81	OP	DV		A	S	13	EX 09
PRODUCTION	DALO	D	D	78	81		N	P	A	P	13	EPS 35
PRODUCTION	RICE	A	A	80	81		N	DS	A	RQ	25	DID 01
PRODUCTION	RAIN FED CROPS	A	A	80	81		N	DS	A	RQ	25	DID 01

Chapter 3

INFORMATION SYSTEMS IN URBAN AND REGIONAL PLANNING

Christian P. Avérous

> One of the Tubuai Islands in the South Pacific is Rurutu, a small island, where, on New Year's day, the custom is for a Committee of three women to visit every house on the island and note every improvement made by women to the island's economy and environment during the previous year. In the same way, a three-man Committee makes a careful list of the work accomplished by men during the same period. The record is then proudly read aloud by the island's Protestant pastor at a full parish meeting, and projects are discussed for the year ahead.

INTRODUCTION

Context

In recent years, urban populations have steadily increased in developing countries and so have expenditures on urban problems by central and local governments, to the point where urban populations and expenditures reach a very significant share of the national population and economy. However, two opposite pressures appear at present: (a) a demand for yet more and better urban services to the populations; and (b) a need to limit public spending in the national economic interest. The answer to this problem depends to a large extent on the management skills of those influencing or taking urban decisions in central and local governments. The management skills in turn depend on information systems and technology which play an increasing role in assisting the decision taking process. In this context, it is timely and essential to review trends concerning information systems for urban/regional planning in developing countries, in the light of the experience already available in OECD Member countries.

INFORMATION SYSTEMS IN URBAN AND REGIONAL PLANNING

Scope of the Paper

This paper focuses on information systems for urban and regional planning. First, information systems will be taken here as a quantitative, synthetic, systemic, and functional set of information:

(a) Quantitative information systems include estimated, measured, or scaled data. Documentation systems, although essential, are not reviewed here.

(b) Synthetic information systems refer to data of a certain degree of aggregation over time, geographic areas, and population groups. Raw data bases are not reviewed here.

(c) Systemic information systems refer to the organization of information according to a conceptual, descriptive, and informative model (in the broad sense of a model, whether or not formalized mathematically), establishing relationships among a set of identified entities.

(d) Functional information systems must serve a clearly specified function. Indeed, since information systems are not ends in themselves but are tools for decision making, the tools have to be designed to serve a specific function. Information systems should be well-adapted to the formulation, implementation, and evaluation of policies and plans. In that sense, it is essential to identify precisely the uses of information systems in urban and national planning.

Second, focus will be placed on changes in information technology with the development of computers, microcomputers, and telecommunications networks, and the advent of remote sensing techniques.

Finally, the concern will be with urban and regional government information systems. Indeed, the task of these governments has been made very complex today with fast urban growth, high demands, and limited public funding. It will be assumed that local governments have taken appropriate options concerning the role played by the market in their local economies, since a global intelligence system for urban and regional planning needs to include the price information system that the market provides in a decentralized way to consumers and producers. The focus will be on local government information systems, what local government can do to improve them, and what the role of the national government may be.

Organization of the Paper

Trends concerning urban and regional information systems will be reviewed, with respect to the major uses of such information systems; the major issues in designing such systems; and the data base and information technology.

FUNCTIONS OF INFORMATION SYSTEMS

The overall aim in developing information systems is to contribute to improved decision taking. More precisely, three major functions can be identified:

(a) descriptive function: to monitor

(b) cognitive function: to understand

(c) normative function: to act at project, programme, or planning levels

These three functions, although examined successively, are interdependent. An information system must be properly understood and described in order to be acted upon. However, the variety of the functions that information systems have to serve in urban and regional planning leads to doubts about the possibility of designing a universal information system.

To Monitor

An information system may help to monitor a state, or to describe a situation. Indeed, if the characteristic criteria of a situation are defined, translated by corresponding indicators, and actually measured, a summary list of the values taken by all the relevant indicators will describe the situation. Such a tool is evidently very simple.

When applied to the urban context, urban profiles are obtained which permit:

(a) the measurement of the state;

(b) monitoring of its changes over time;

(c) an indication of intra- or interurban disparities by comparing the state of different geographic areas;

(d) the definition of a typology of cities using statistical techniques, such as factor analysis.

The simplicity of these profiles will ensure that they are widely understood.

An extension of this idea is the concept of a "white paper" or a report on a situation. This is often used as a tool to:

(a) establish the agenda for policy actions and the background information for the elaboration of plans; and

(b) inform the public and its relevant components (e.g., industrialists, scientists, teachers, and students) of the situation.

This latter point is of major importance in democratic societies, and may contribute to give factual foundation to public opinion on the matter.

Public opinion surveys are also examples of the use of information systems to monitor the state of public opinion. With proper design of the questions and of the survey, as well as proper analysis of the results, public opinion surveys may be important tools for programming and planning. An example is provided by the work of the city of Vienna (Austria) which reviewed both the objective state of the housing stock and the users' perception of it; particularly interesting are the cases where there is a discrepancy between the actual state and the perceived state.

National and international programmes of urban statistics should be cited here, although their function can be wider than the descriptive function itself. Efforts are made to integrate them with sociodemographic statistics and to link them to economic statistics and to environmental statistics. They are often based on and benefit from census information. There is, however, a great need for their harmonization at the international level.

To Understand

Information systems contribute to improving our understanding of urban and regional phenomena by providing a tool for analysing the interdependencies of key variables. Some hypothesis and their derived relationships can be tested by the usual statistical methods. Although the concept of causality is a difficult one to handle in highly integrated systems, the analysis of the effects of some variables such as environmental quality on health or on crime might be improved by this means.

Also, models which analyse interdependent variables, whether based on systems analysis, on the theory of graphs, or on matricial or methods of input-output analysis, can be tested with the data of information systems, and thereby benefit from them. They may also conversely help organize information systems by providing conceptual references.

To Act

Information systems contribute to improved action by reducing the cost of actions with known consequences, or by reducing uncertainty about the consequences of actions already taken or to be taken. First, and for actions with known consequences which are taken routinely, information systems can help to reduce the costs of implementing these actions. This is the case with a number of managerial tasks which are well-adapted to computerization: the management of public administration personnel (payroll, holidays, pensions); the maintenance of population records, voters' lists, and registers of births, marriages, and deaths; the management of the local tax system; the payment of various social benefits; the billing for water and electricity; and the management of local government budgets with sound accounting principles, accurate records, and proper transparency. It is to be noted that this population and fiscal information base is essential for the development of projects, programmes, and plans, because it requires periodic review as part of demographic and fiscal policies and also because it provides a fundamental data base for other policies such as housing, health, transport, security, education, and environmental policies.

Second, information systems can be used to monitor the impact of decisions already taken, and thus help measure the deviation between reality and the target situation originally contemplated. Further corrective decisions can be taken in response to this deviation. The lead time may be very small as in the case of alert systems with built-in corrective actions, or may be very long when corrective decisions entail the definition and implementation of new projects, programmes, or plans.

A first example is provided by urban air pollution alert systems. These systems measure actual levels of air pollution over the stations of the city monitoring network, and compare them with ambient air quality "standards." If such standards are met, nothing is done; when and where such standards are not met, or are not expected to be satisfied, then curative or preventive measures can be taken, such as switching to less polluting fuels, or voluntarily restraining from nonessential activities. Such systems were first developed in Japan, and now exist in a number of large cities.

A second example is provided by regional flood alert systems. The most advanced systems include automatic measurement and transmission of hydrological and meteorological data in a few minutes to a central analysis station, the calculation of short-term forecasts, and the issuance of warnings by means of a telephone system specially designed to alert relevant decision makers and populations about various types of risks, including floods.

A third example is provided by management and planning mechanisms which monitor situations by means of a number of key indicators and which respond with varying degrees of automation to the reported deviations. In particular, information systems may play an important role in mechanisms of fund allocation among cities or regions: this is the case when sector-specific subsidies have to be allocated to public transport systems, for example, according to levels of performance and of social services rendered; this is also the case when block grants have to be allocated according to revenue sharing formulae among cities or regions without specifying precisely the destination of the funds.

Third, information systems can be used to evaluate the impacts on reality of decisions to be taken. Indeed it is common to evaluate projects, programmes, or plans with respect to assigned objectives.

The technique of cost-benefit analysis focuses on the efficiency objective and seeks a monetary expression for the impacts of the decision. For public projects, programmes, and plans, there is a need: (a) to include also the effects not expressed or incorrectly expressed by the market system (i.e., the external effects); and (b) to identify clearly the groups (e.g., administration, enterprises, households) which comprise the collectivity for which decisions are to be taken. Cost-benefit analysis has been criticized on grounds of theoretical difficulties concerning the assumptions of rational behaviour of economic agents, aggregation of individual preferences, marginal reasoning, and treatment of the future, and also on grounds of some practical problems related to the use of a single monetary measure. Cost-benefit analysis remains however a means of avoiding major efficiency errors, of analysing the distributive impacts on various groups, and of preparing the financing of projects by reinforcing their technical and economic credibility.

From the point of view of information systems, it would seem that techniques to serve decision taking should transmit information to the various parties concerned rather than provide them with the selected decision. This is why the multiple criteria analysis technique substitutes to a single monetary indicator relating to the economic efficiency objective, a set of monetary, physical, or ordinal indicators relating to a set of objectives, with the aim of feeding the decision making process with the analytical information which contributes to the debate on the main points of the project, programme, or plan. Information systems, therefore, need to contribute the basic physical and economic information for the evaluation to be carried on, including monetary, physical, and ordinal indicators, with proper disaggregation by groups and areas and with proper time scale.

Figure 12. Integrated municipal information system of Indianapolis (U.S.A.)

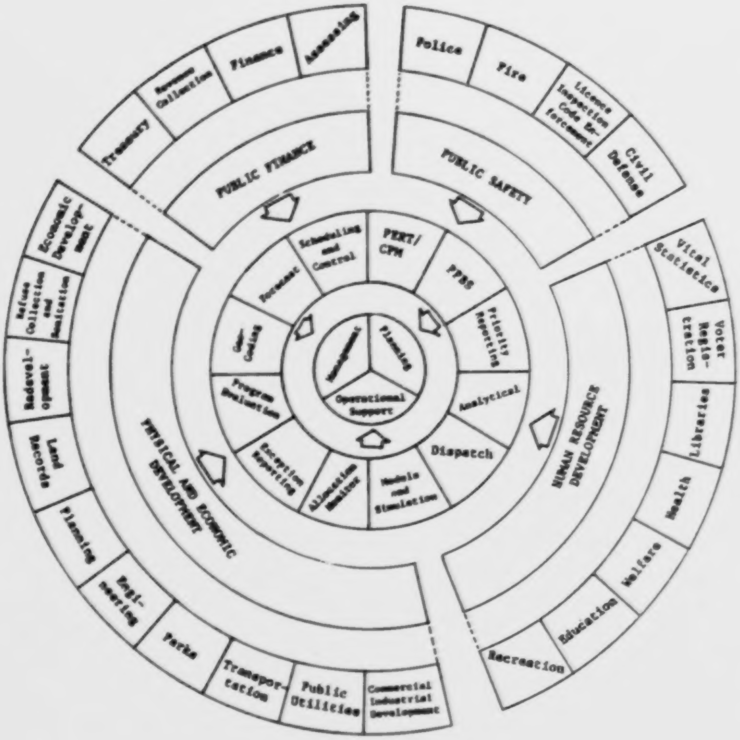
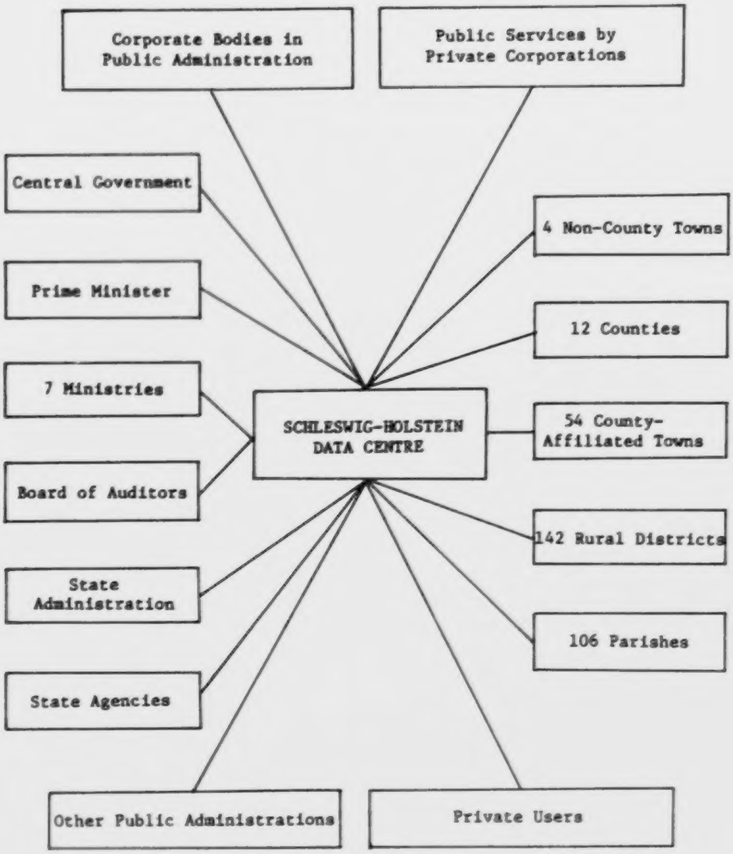

Treasury
Revenue Collection
Finance
Assessing
Police
Fire
Licence Inspection Code Enforcement
Civil Defense
PUBLIC FINANCE
PUBLIC SAFETY
Economic Development
Refuse Collection and Sanitation
Redevelopment
Land Records
Planning
Engineering
Parks
Transportation
Public Utilities
Commercial Industrial Development
Vital Statistics
Voter Registration
Libraries
Health
Welfare
Education
Recreation
PHYSICAL AND ECONOMIC DEVELOPMENT
HUMAN RESOURCE DEVELOPMENT
Scheduling and Control
PERT/CPM
PPBS
Priority Reporting
Analytical
Dispatch
Models and Simulation
Allocation Monitoring
Exception Reporting
Program Evaluation
Geo-Coding
Forecast
Management
Planning
Operational Support

Figure 13. Schleswig Holstein Data Centre: authorities and other users (Federal Republic of Germany)


Corporate Bodies in Public Administration
Public Services by Private Corporations
Central Government
4 Non-County Towns
Prime Minister
12 Counties
7 Ministries
SCHLESWIG-HOLSTEIN DATA CENTRE
54 County-Affiliated Towns
Board of Auditors
142 Rural Districts
State Administration
106 Parishes
State Agencies
Other Public Administrations
Private Users

MAJOR ISSUES IN DESIGNING INFORMATION SYSTEMS

The major issues concerning the design of information systems for urban and regional planning are grouped here under three headings:

(a) people and information technology;

(b) local government and information systems; and

(c) national government and information systems for urban and regional planning.

People and Information Technology

Information technology brings direct benefits to people, by improving the delivery of a number of services to users. These benefits, which should be maximized include:

(a) reduction in time spent completing forms;

(b) speed and reduced waiting time in the delivery of routine documents and operations;

(c) reduction in the number of errors and related complaints; and

(d) provision of choice in the modalities of payment.

Information technology also provides an opportunity for better information of the public; examples are routine information on urban conditions such as weather or pollution information and forecasts, as well as periodic urban reports or white papers on key aspects of the state of the city. Information technology further provides an opportunity for more informed participation of the public in decision making processes; examples are the voluntary adaptation of travel patterns to traffic conditions monitored and reported by radio, or anticipated and reported by press, radio, and TV; another example is provided by public participation in environmental impact assessment procedures for specific projects.

Attention should be given to possible breakdowns of computerized information systems and related paralysis in the provision of major public services to important segments of population. Breakdowns are not specific to information systems, but highly integrated and automated systems may be more vulnerable to such dysfunctions. Information systems are a new infrastructure of cities and regions and require sufficient protection.

Privacy protection also requires attention, although it has not proven to be a serious problem. The technology provides a great variety of facilities for avoiding access to confidential information to nonauthorized personnel and users. They include software controls such as passwords and access codes, physical admittance restrictions by means of guards, locks, identification cards, as well as administrative procedures including identification of levels of secrecy and of those who should be allowed to have access, and controls on the provision of information to authorized users. National governments have to provide proper legislation and regulations concerning the safeguarding of confidentiality of sensitive data kept or used by urban and regional authorities. A more recent concern relating to privacy protection has arisen with the increasing penetration of data banks and information systems within the homes; as a new media comparable to radio and television, they require adjustments to national and/or local regulations.

Local Government and Information Systems

The introduction of information technology in local government followed a common process. The first efforts focused on applications dealing with administrative tasks making use of voluminous files, with fairly repetitive processing operations (e.g., personnel management, accounting tasks, population records, and payment of social benefits). Then, the second type of efforts dealt with the use of information technology as a local management tool, as a by-product of previous applications (e.g., instant information on the state of budget spending), or with specifically designed efforts. The third type of efforts further aimed at the integration of the various applications into "municipal information systems" to satisfy not only local managerial needs but also short-term decision making and planning tasks. This applied to financial information systems, population information systems, and physical information systems. The fourth type of efforts aims at uses for medium- and long-term planning and focuses on the development of models and on building up data banks for planning.

Improving effects on individual tasks

A first major issue is the improvement of the effects of information technology on individual tasks by enhancing the benefits and minimizing the adverse effects. This requires a design of information systems well aware of their potential and limits.

Usually, operating personnel welcome information technology, because they perceive improvements concerning speed in processing, capacity to deal with more complex cases, and time saved for other tasks. However, coding tasks should be spread among personnel, and a short initial period of adaptation is necessary.

Usually, management staff view data processing as a technological development, which enables them to devote more time to their actual function and less time to routine tasks, and to have at hand a tool responsive to one of their managerial functions. It is important to develop management oriented services and to start with motivated officials or offices before spreading the system to other offices.

Elected decision makers often perceive information systems in terms of their costs when voting the budget, and in terms of prestige for their community, as such systems are associated with modern sophisticated management. More awareness would be needed of the limits and potentials of information systems with respect to decision making and with respect to the structure and organization of local governments.

Relations between users and data processing departments do not usually create major problems, and require a joint user data processing department committee, and each department to have a data processing correspondent.

Training

A second major concern for local government is training. Towns allocate time and money to training which do not always seem adequate. The training provided by manufacturers should be supplemented by proper training by general education, and by national agencies dealing with information technology, and/or urban and regional planning. It is likely that the problem will disappear when information technology ceases to be a new technique and is widely taught as part of general education.

Past experience suggests that:

(a) operating staff should receive technical instruction less oriented towards a particular brand, which would facilitate change of equipment and decrease dependence on the manufacturer;

(b) heads of data processing departments often need to learn about the local government, its structure and power, and on urban and regional planning needs;

(c) administrative personnel should receive a less technical training focusing on the constraints and potentialities of information technology and on communication with the data processing department; and

(d) decision makers should be in a position to decide on computer identification for management and decision making.

Effects on local government organization

A third major issue concerns the effects of information systems on local government organization. They are both an opportunity for more effective organization and a mechanism to reveal potential conflicts.

Data processing changes the internal structure of departments and tends gradually to lower communication barriers between departments, to share information and avoid duplications. Unless these barriers are overcome, data processing can only be developed with difficulties beyond the stage of automating routine operations towards short-term planning and medium- and long-term integrated decision making.

It is not clear whether data processing will contribute to centralization for the benefit of the data processing department and the city decision makers (as often argued in relation to the use of main computer frame) or will contribute to decentralization (as often argued in relation to the introduction of microcomputing units). The answer is probably that the tool is fairly neutral in itself and that the impact depends largely on how the tool is used.

The data processing department usually appears as a service to other departments and is under an interdepartmental authority at the decision making level. This is a positive aspect to develop information systems to serve decision making more directly.

Improving services provided by local government

A fourth major issue is the need to maximize the benefits that information systems may offer for services provided by local government. Services rendered by local government to users are usually improved. The main causes for satisfaction are greater promptness; quality of service; adjustment to changes in rules and regulations; and reduced rate of error. Some new services are also provided, which cannot be provided without computers.

Furthermore, information technology helps decision makers to review and improve the operation of their administrations, and to better control the local finances.

Finally, it contributes to a number of medium- and long-term planning tasks, such as population projections basic for the definition of service and infrastructure investment levels and financial projections both on the side of expenditures (relating particularly to proposed investment and related running costs) and on the side of income to assess the realism of investment plans and proceed with the relevant arbitrations.

Cost-benefit analysis of information systems in local government

A fifth major issue is that the design and use of information systems should be based on a much more careful analysis of costs and benefits, both financial and nonfinancial, and of risks than currently exists. Decisions on information systems and information technology are often based on faith: computer use is believed to be profitable.

On the costs side, it is easier to estimate the overall costs when service is provided by an outside consulting firm. Otherwise, the costs known are those of equipment, of staff support, and of supplies. Usually, little is known about the costs of research and the costs of training.

In order to reduce costs, sharing experience should be developed among local governments. It is workable and allows a more rapid growth of information systems use. However, sharing experience may be inhibited by self-interest, bad experience, lack of opportunity, and budget constraints. Sharing resources and avoiding duplication of work can, of course, be done among the departments of the same local government, but can also involve several local authorities and towns. It can apply to hardware, software, data collection, and data access. More broadly, the question of availability and transferability of information systems between local authorities need to be examined by national and international bodies.

On the benefits side, it is usually agreed that data processing has not brought about any reduction in the number of office staff but has slowed down recruitment; in other words, more work is done with the same total staff. Some cities have calculated benefits derived from specific applications, such as improving cash position by collecting electricity bills sooner, or by better managing stock of supplies. Indirect benefits on improved management and decision making, and on time saved from routine administrative tasks for professional staff should also be assessed, as well as risks related to possible levels of failure of the system.

National Government and Information Systems for Urban and Regional Planning

Usually, local authorities would rather invite national government participation. This is because costs and risks of experimentation are too high and expertise is too difficult to obtain and keep by a single local authority. Local authorities expect national government to provide consistent and coordinated legislative framework, policy guidance, as well as programme and project activities; programme activities are of particular interest for local authorities because of the national financial resources attached to them. However, money is not an end in itself, and can be ineffective if spent in the wrong way.

Local authorities expect national government:

(a) to provide support (financial and technical) to develop the computer configuration including hardware and software to meet their needs particularly with respect to assisting managerial and medium- and long-term decisions;

(b) to contribute to data base development by helping in data interchange and standardization; this applies not only to various local authorities but to various tiers of government as well;

(c) to assist them in evaluating the impact of information systems in order to enlighten further choices: this expectation of local authorities is based on the assumption that comparative studies and independent service can best be provided by a national government official;

(d) to provide and/or support training courses concerning information systems.

Thus, national government is well placed to play a major role: (a) in stimulating the development of information technology and information systems for urban and regional planning through training, expert assistance, and financial support; and (b) in coordinating this development through legislative and regulatory action, as well as through the harmonization of hardware, software, data, and data communication systems.

DATA BASE AND INFORMATION TECHNOLOGY

Building Data Bases for Urban and Regional Planning

The design of data banks has often followed one of two approaches. Some data banks have been built on a routine basis for administrative purposes; these data concern population information, finance information, and physical information on land and buildings. Some other data banks have been built on the basis of modelling efforts and decision making needs, using data from various sources including administrative data, monitoring data, and survey data. These two approaches are not divergent and may indeed support each other; the first one lacks direct adaptation to decision making, particularly to management decisions and medium- and long-term planning decisions; the second one often meets difficulties with specific data collection efforts which proves too costly to implement or at least to repeat periodically, thereby leading to problems of coverage and updating of the data bank. Presently, efforts are often done to integrate better these two approaches.

Data Collection

Traditional data collection for urban and regional information systems is thus based first on administrative files and their updating. Second, there is monitoring data which concern, for instance, weather, environmental, and traffic conditions. There is a need in some cases to modernize and rethink these monitoring networks. Taking environmental conditions as an example, monitoring practices are under review to improve them and some are questioning the location and functioning of some monitoring stations, the excessive focus on traditional pollutants and on outdoor environmental conditions at the expense of understanding multiple exposure of individuals, and the absence of monitoring of some key environmental parameters. Third, survey data supplement on key topics, administrative and monitoring data. They are however limited particularly by the quality of the surveying process and by the problems of updating. It is more and more argued that the problem is not more data, but better data.

There are major difficulties with the development of economic data to found proper cost-benefit analysis. With a dispersion of information among various levels of government, agencies, and departments at the same level of government, as well as with unadapted budgeting and accounting practices, it is often difficult to estimate the costs of a given programme and even more difficult to estimate its benefits. For instance, revenues and expenditures for urban transport services are often very difficult to understand: expenditures involve various public transport companies and government services (e.g., police, traffic, and road departments), revenues not only involve users, but also employers and various levels of governments with a number of transfers which render difficult the building of an accurate global picture. Similarly, the provision of water services involves a superposition of intricate financial arrangements which have accumulated over the years and do not lend themselves to measurement without special studies.

On the benefit side, too little is known in terms of the nonmarket benefits of public programmes. Externalities are not well assessed, as for instance with avoided damages due to pollution abatement efforts.

There are also difficulties with the development of data bases to serve decision making. The cost of additional surveys and the administrative difficulties to carry them out, coupled with the constraints on public funds have led:

(a) to focus on "better data" rather than "more data";

(b) to search for solutions that new technologies can support with the development of microprocessors and data networks on the one hand, and with remote sensing on the other hand.

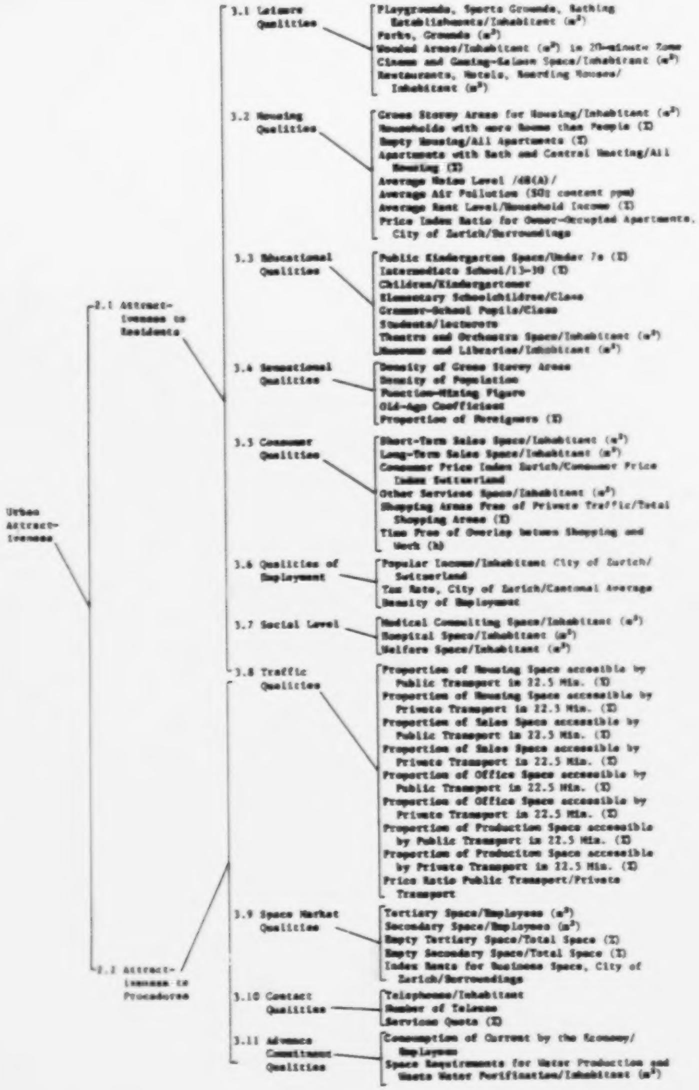
Urban and Regional Indicators

Urban indicators are quantitative, particularly synthetic, systemic information directly adapted to descriptive or normative functions (for example, see figures 14 and 15). They can provide a major link between the data bases and the decision making process; in that way indicators try to achieve the original aim of statistics, that is, to be an applied political science.

Sets of urban indicators can be used within decision making. Their implementation within administrative and institutional structures involve technical and political questions. The technical ones range from traditional issues concerning data by population characteristics (such as income, social status, and location), definitions of target area, and frequency of measurement, to issues concerning flexibility of a set of indicators to adjust to changes in values and policy needs, and to their requirements in terms of efforts. The political questions relate to the selection and changes of concerns, the relation of indicators to standards, the institutionalization of development and use of sets of urban indicators, and the associated costs of management.

The use of indicators can help in political and technical decisions, but it is of course no substitute for them.

Figure 14. The indicator system for the City of Zurich (Switzerland)


Urban Attractiveness
2.1 Attractiveness to Residents
2.2 Attractiveness to Producers
3.1 Leisure Qualities
Playgrounds, Sports Grounds, Bathing Establishments/Inhabitant (m^2)
Parks, Grounds (m^2)
Wooded Areas/Inhabitant (m^2) in 20-minute Zone
Cinema and Gaming-Saloon Space/Inhabitant (m^2)
Restaurants, Hotels, Boarding Houses/Inhabitant (m^2)
3.2 Housing Qualities
Gross Storey Areas for Housing/Inhabitant (m^2)
Households with more Rooms than People (%)
Empty Housing/All Apartments (%)
Apartments with Bath and Central Heating/All Housing (%)
Average Noise Level /dB(A)/
Average Air Pollution (SO_2 content ppm)
Average Rent Level/Household Income (%)
Price Index Ratio for Owner-Occupied Apartments, City of Zurich/Surroundings
3.3 Educational Qualities
Public Kindergarten Space/Under 7s (%)
Intermediate School/13-30 (%)
Children/Kindergartener
Elementary Schoolchildren/Class
Grammar-School Pupils/Class
Students/Lecturers
Theatre and Orchestra Space/Inhabitant (m^2)
Museums and Libraries/Inhabitant (m^2)
3.4 Sensational Qualities
Density of Gross Storey Areas
Density of Population
Function-Mixing Figure
Old-Age Coefficient
Proportion of Foreigners (%)
3.5 Consumer Qualities
Short-Term Sales Space/Inhabitant (m^2)
Long-Term Sales Space/Inhabitant (m^2)
Consumer Price Index Zurich/Consumer Price Index Switzerland
Other Services Space/Inhabitant (m^2)
Shopping Areas Free of Private Traffic/Total Shopping Areas (%)
Time Free of Overlap between Shopping and Work (h)
3.6 Qualities of Employment
Popular Income/Inhabitant City of Zurich/Switzerland
Tax Rate, City of Zurich/Cantonal Average
Density of Employment
3.7 Social Level
Medical Consulting Space/Inhabitant (m^2)
Hospital Space/Inhabitant (m^2)
Welfare Space/Inhabitant (m^2)
3.8 Traffic Qualities
Proportion of Housing Space accessible by Public Transport in 22.5 Min. (%)
Proportion of Housing Space accessible by Private Transport in 22.5 Min. (%)
Proportion of Sales Space accessible by Public Transport in 22.5 Min. (%)
Proportion of Sales Space accessible by Private Transport in 22.5 Min. (%)
Proportion of Office Space accessible by Public Transport in 22.5 Min. (%)
Proportion of Office Space accessible by Private Transport in 22.5 Min. (%)
Proportion of Production Space accessible by Public Transport in 22.5 Min. (%)
Proportion of Production Space accessible by Private Transport in 22.5 Min. (%)
Price Ratio Public Transport/Private Transport
3.9 Space Market Qualities
Tertiary Space/Employees (m^2)
Secondary Space/Employees (m^2)
Empty Tertiary Space/Total Space (%)
Empty Secondary Space/Total Space (%)
Index Rents for Business Space, City of Zurich/Surroundings
3.10 Contact Qualities
Telephones/Inhabitant
Number of Telexes
Services Quota (%)
3.11 Advance Commitment Qualities
Consumption of Current by the Economy/Employees
Space Requirements for Water Production and Waste Water Purification/Inhabitant (m^2)

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Technological Development: Microprocessors and Data Networks

Two twin major technological developments are increasing and will increase the potential and attractiveness of relying on data from other data banks. The microprocessor has drastically reduced the costs and the size of computing systems. National public data networks, such as EURONET (European Communities), Nordic Public Data Network (Scandinavia), and TRANSPAC (France) organized by the postal and telecommunication administrations in Europe, are developing, using a combination of traditional cable and hertzian transmissions and of telecommunication satellites and fiber optics transmission which provide with cost-efficient, high-volume transmissions over long distances. As a consequence, most computer systems are becoming interactive, with instant access to each other, and with many terminals used for access to central memories. Increasingly, urban and regional planning organizations at various levels of government will have access to memories outside of their own systems.

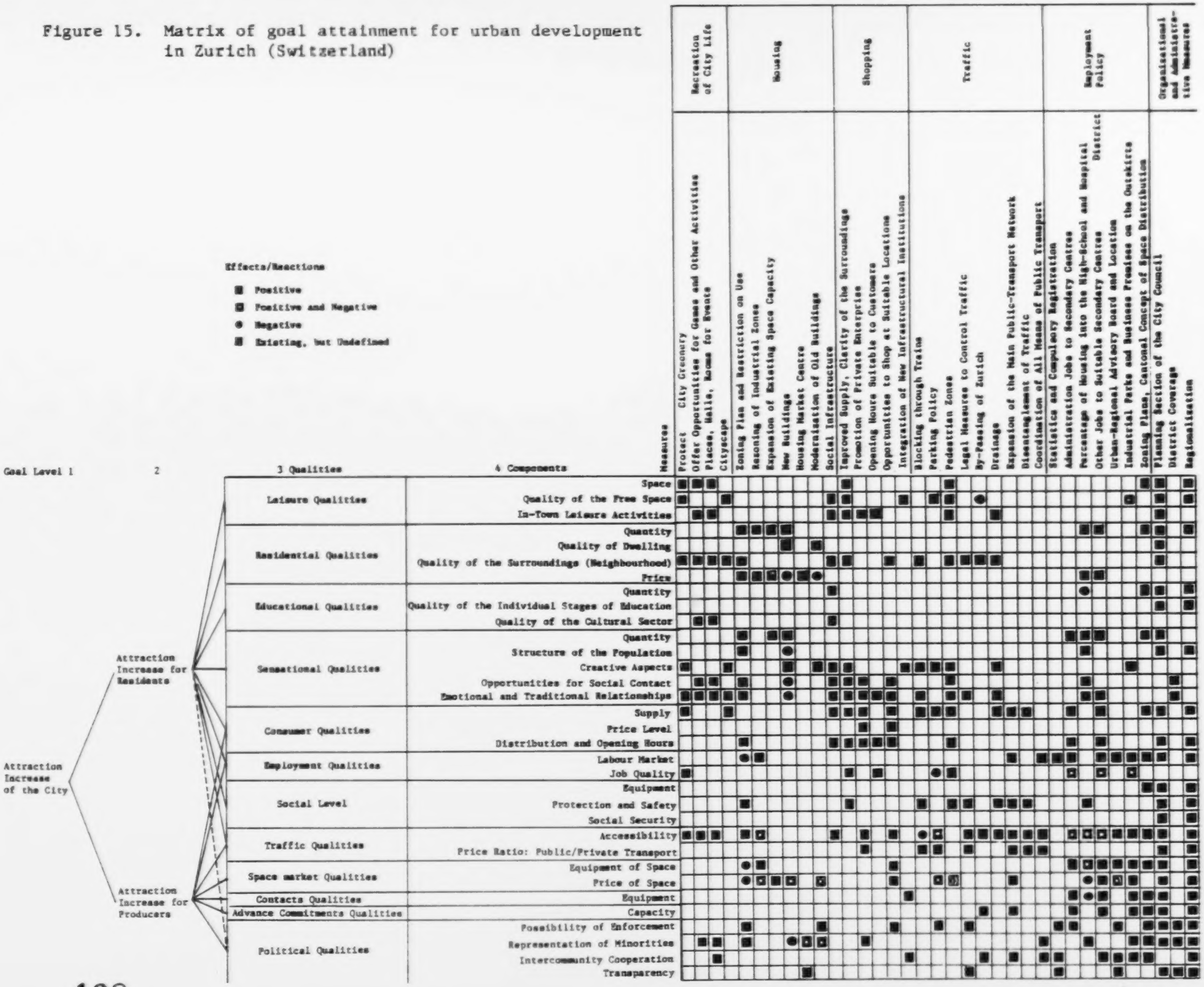
These developments generate issues of inventories of information systems concerned with urban and regional planning; connexion and access among them and related compatibility of hardware and software; data harmonization by use of standard definitions, nomenclatures, and classifications as well as measurement and estimation methods. It is clear that national governments have a major role to play in that respect.

Technological Development: Remote Sensing

Remote sensing is a system for collecting numerical and cartographical data from a distance. The system comprises the collection of physical data on the surface of the earth and its cover and environment, as well as the processing, interpretation, and reconstruction of these data. Data are collected from observation platforms which carry passive or active sensors (see figure 16). Remote sensing from space offers more advantages and is more satisfactory in operation than aircraft methods because of the quasi-instantaneity of the recordings and the standardization of data acquisition in processing methods. Actually the Landsat sattelites provide most of the data for the urban and regional planning studies. Each user can obtain standard products in receiving stations: images in black and white or in false colour and magnetic tapes. Digital processing of the computer compatible tapes includes three possible forms:

(a) Production of enhanced false colour images for interpretation;

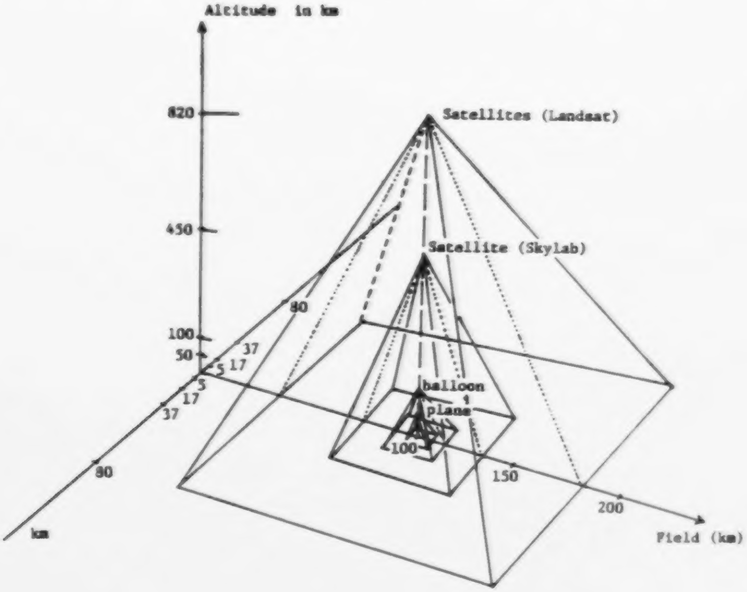
Figure 15. Matrix of goal attainment for urban development in Zurich (Switzerland)


Effects/Reactions
■ Positive
▣ Positive and Negative
● Negative
■ Existing, but Undefined
Measures
Recreation of City Life
Housing
Shopping
Traffic
Employment Policy
Organizational and Administrative Measures
Protect City Greenery
Offer Opportunities for Games and Other Activities
Places, Halls, Rooms for Events
Cityscape
Zoning Plan and Restriction on Use
Rezoning of Industrial Zones
Expansion of Existing Space Capacity
New Buildings
Housing Market Centre
Modernization of Old Buildings
Social Infrastructure
Improved Supply, Clarity of the Surroundings
Promotion of Private Enterprise
Opening Hours Suitable to Customers
Opportunities to Shop at Suitable Locations
Integration of New Infrastructural Institutions
Blocking through Trains
Parking Policy
Pedestrian Zones
Legal Measures to Control Traffic
By-Passing of Zurich
Drainage
Expansion of the Main Public-Transport Network
Disentanglement of Traffic
Coordination of All Means of Public Transport
Statistics and Compulsory Registration
Administration Jobs to Secondary Centres
Percentage of Housing into the High-School and Hospital District
Other Jobs to Suitable Secondary Centres
Urban-Regional Advisory Board and Location
Industrial Parks and Business Premises on the Outskirts
Zoning Plans, Cantonal Concept of Space Distribution
Planning Section of the City Council
District Coverage
Regionalization
Goal Level 1
2
3 Qualities
4 Components
Attraction Increase of the City
Attraction Increase for Residents
Attraction Increase for Producers
Leisure Qualities
Space
Quality of the Free Space
In-Town Leisure Activities
Residential Qualities
Quantity
Quality of Dwelling
Quality of the Surroundings (Neighbourhood)
Price
Educational Qualities
Quantity
Quality of the Individual Stages of Education
Quality of the Cultural Sector
Sensational Qualities
Quantity
Structure of the Population
Creative Aspects
Opportunities for Social Contact
Emotional and Traditional Relationships
Consumer Qualities
Supply
Price Level
Distribution and Opening Hours
Employment Qualities
Labour Market
Job Quality
Social Level
Equipment
Protection and Safety
Social Security
Traffic Qualities
Accessibility
Price Ratio: Public/Private Transport
Space market Qualities
Equipment of Space
Price of Space
Contacts Qualities
Equipment
Advance Commitments Qualities
Capacity
Political Qualities
Possibility of Enforcement
Representation of Minorities
Intercommunity Cooperation
Transparency

(b) Performance of arithmetical or logical operations; and

(c) Automatic classifications known as nonground truthed or ground truthed processing.

Figure 16. Observation platforms of the earth


Altitude in km
820
450
100
50
Satellites (Landsat)
Satellite (Skylab)
80
37
17
5
5
17
37
80
km
balloon
plane
100
150
200
Field (km)

Multidate analysis can be effected also (see Appendix A).

Remote sensing has been used in a number of studies and experiments concerning land use and land use planning, water resources, coastal areas, agriculture and forest land, vegetation cover, and soil capability. For example, it can be used at the urban planning level:

(a) land use and land cover maps and statistical tables have been produced in urban regions (e.g., Paris region, metropolitan Washington, and Sydney metropolitan area) and can review changes of land use over time (e.g., three to five years).

(b) vegetation density in urban regions can be estimated by use of a biomass index and mapped;

(c) zoning maps and statistical tables have been produced according to housing density and age, as well as vegetation cover in a number of cities;

(d) imperviousness has been estimated in urban areas by watersheds and administrative units; and

(e) heat losses by buildings and networks have been identified during winter (remote sensing from plane); there is also some debate in the U.S.A. about the potential of remote sensing to be part of census efforts.

Remote sensing can also be used at the regional planning level; examples of studies and experiments are available concerning:

(a) Geology: Updating of geological maps, maps of the main geological zones, assistance to mining and petroleum exploration, mapping of fracture lines, earth movements, and geothermal sources, and identification of granulates;

(b) Land use and development: Mapping and statistics concerning land use and coastal zones, changes in land use, soil suitability and agriculture potential maps, erosion risk maps, maps showing plant cover and relative importance of green biomass, site selection for building large structures, and evaluation and follow up of the impact of major works;

(c) Forests: Mapping of major types of forest, locating disease and insect attacks, monitoring the effectiveness of treatment, estimating potential standing production, monitoring of felling of trees, deforested areas, and regeneration, determination of areas sensitive to or endangered by human pressures and activities, monitoring of fires, and evaluation of fire risk and degree of humidity;

(d) Water resources: Definition of hydrologically homogeneous areas, inventory and mapping of water surfaces, areas liable to flooding, flooded areas, swamps and peat bogs, emerging or submerged vegetation (algae and water plants), meeting-points between fresh and salt water, salinity, turbidity, movements of sediment, discharges, currents, assistance in site selection for reservoirs, canals, feed channels, and dikes, assistance in hydrogeological research, mapping of surfaces covered with snow or ice, dispersion of pollution in estuaries and along coastlines, and locating accidental coastal oil pollution;

(e) Other environmental aspects: Biophysical or ecological zoning (ecozone mapping), habitats favourable to various types of fauna, assessment of the effects of natural calamities and disasters, landscape categories and shapes, aid to decisions concerning zones to be protected, inventory and monitoring of protected zones, radiation amounts, mapping of wet zones by category, evaluation of the effects of human activities on the environment: lake eutrophication, water quality and pollution, air pollution effects on plant life, gravel and sand quarries, and active or inactive open cast mining sites.

It is now possible to begin to evaluate the status of the technology existing at a time when a new generation of earth resource satellites is emerging. Remote sensing offers many advantages over the traditional techniques. It is exhaustive, localized, and unaffected by administrative boundaries; adaptable for large countries and for certain international studies; global in scope, synoptical in sight; repetitive in process; and moderately priced and swift. On the other hand, remote sensing has limitations, including ground resolution, spectral and radiometric resolution, variations of spatial signatures in space and time due to atmospheric disturbances, meteorological conditions for visible and infrared channels, and efficiency, complexity, and cost of computer processing.

A number of satellites with more sensitive sensors, with improved ground resolution limits and, in some cases with radar wave and passive microwave equipment capable of operating in all weather conditions, were launched or are to be launched now or in the next few years. But the costs of remote sensing using these second-generation satellites, e.g., Landsat 4 and 5 and Stereosat (U.S.A.), SPOT (France), ERS (ESA), JERS (Japan), and Radarsat (Canada), are likely to be different from existing prices (table 3.1). On the one hand, costs for data acquisition are anticipated to be five to ten times greater than the cost of processing, and for interpretation three or four times higher; on the other hand, it is likely that cheaper and more easily usable processing methods will be available.

Since there are a number of gaps in statistics concerning urban and regional planning and difficulties to carry on surveys particularly in a periodic way, remote sensing may prove to be a valuable supplement to traditional sources of information. It provides a satisfactory approach to improve information on land use, zoning, and other urban planning concerns, and to improve information on location, land use, natural resources, agriculture and forestry, and other regional planning concerns.

TABLE 3.1. NEW GENERATION OF REMOTE SENSING SATELLITES

	Landsat -TM (1)	SPOT (2)
Period	1983 - 88	1985 - 95
Wavelength bands	7 (3)	3 visible or 1 visible
Resolution	30 m	20 m or 10 m
Field covered	185 x 185 km	60 x 60 km
Access time	16 days	1 to 4 days

Notes: (1) TM = Thematic Mapper
(2) Including 1 thermal infrared
(3) Provides stereoscopic analysis possibilities

SUMMARY AND CONCLUSIONS

Information systems are tools for urban and regional planning and not ends by themselves; they have to perform a function — descriptive, cognitive, or normative — within decision making and as such are to be assessed not only in technical terms but also in terms of their contribution to rational government and to political life.

Information systems must be designed with a number of issues in mind: service to the public, information and participation of the public, vulnerability of the systems, privacy protection, impacts on the personnel of local government, training needs, impacts on local government organization, cost-benefit analysis of their introduction and development, and national government role in stimulating and coordinating the development of such systems in local government.

The building of data bases from administrative files and from data collection for planning needs, still suffers from lack of economic data and encounters financial and administrative constraints. However, the problem now is to have better rather than more data, and its solution may benefit from technological developments: microprocessors and data networks should contribute to sharing information among data bases, and remote sensing techniques should produce supplementary data, independent of institutional frontiers and relatively less costly than traditional surveys. Urban indicators work should help to better connect data bases and decision making needs.

The sharing of experience on information systems within countries and among countries, and the harmonization of hardware, software data, and data transmission appear as major tasks for national governments and international institutions.

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APPENDIX A. EXAMPLES OF REMOTE SENSING PRODUCTS

False colour image

It is produced using data from channels 4, 5, and 7. During photographic printing a specific colour is allocated to each channel. For instance:

Channel	4	5	7
spectral band	green	red	near infrared
specific colour	blue	green	red

The image obtained is not comparable to the one seen by an astronaut since the human eye is not sensitive to infrared radiation; vegetation appears in red, urban areas in blue, etc.

Supervised classification: maps

Land use maps can be produced automatically with this processing. Elementary pictures (pixels) are allocated to different land use categories according to their spectral signature (in all available wave length bands). In the first stage, the categories are defined using ground data to test the signature of various types of land use. In the second stage, all the pixels are processed and classified without testing.

Supervised classification: statistical tables

These tables can be automatically computed according to the above-mentioned process, by spatial unit (administrative or not) and by land use category.

Multidate image

Comparisons between images recorded at different dates are expressed on a single map, by superposition of chosen colours according to the changes to be studied.

Chapter 4

APPLICATION OF INFORMATION SYSTEMS IN PUBLIC ADMINISTRATION

Edited by
Itoko Suzuki

INTRODUCTION

The Role of Public Sector Organizations and Information for Development

The role of public administration and management is increasing in many countries, particularly in developing countries. This phenomenon is due to, among other things, the development of demand by citizens for social action and public services which have to be funded and monitored by local, regional, and central administrations of governments; the growing complexity of society and the economy; and the need for government regulation of economic and social development. At the same time, the increase in public administration costs should be minimized, as public administration seldom engages in the productive sector. The cost consideration in public administration in several developed countries with mixed economies has encouraged the promotion of privatization of a number of functions of public administration. Additionally, public management, referring to the management of public enterprises and other public sector ventures, has also to compete with the efficiency and productivity of private sector management. All these considerations have called for a rapid increase in the efficiency, productivity, and performance improvement on the part of public administration and management through the use of information technology.

Information plays a vital role in planning and implementing all aspects of public sector programmes, which are crucial for developing a country and enhancing its self-reliance. However, availability of information is not always well known, and access to it is not necessarily easy. Information is frequently not timely and its reliability can be questionable. Additionally, information available in respect of the different activities of society is often uneven and therefore of limited value for analytical purposes. This means that available information can be underutilized or inefficiently and ineffectively utilized. As public sector organizations have to collect, process, use, and disseminate information, the increased use of information technology is supposed to enhance their efficiency in administration and public sector management.

Major Problems and Issues

While shortage of physical, technical, and human resources is a universal problem in applying information systems, misutilization and gross underutilization of information systems are frequently observed by many United Nations advisory missions in developing countries. A recent United Nations study on this subject observed that generally, there is a gap between the current state of the art of information systems in public administration and their actual utilization in many developing countries. There is particularly a gap between the present level of use of information systems and the plans in developing countries. An additional gap is frequently observed between the planned use of individual information systems and their actual use. The United Nations study has analysed the various problems of information systems which cause these gaps with a view toward improving administrative and management processes, based on several national and international experiences.

Those administrative and managerial issues can be categorized for analytical and problem-solving purposes at two levels: (a) policymaking level; and (b) organizational management level. Several technical reports from developing countries (e.g., Burma, Nepal, and Sri Lanka), indicate the overall inadequate state or even lack of policy on information resource management, which aggravates the issues of under- and misutilization of information systems and mobilization of information resources of these countries. Performance of technology is dependent on the organizational policy and management which govern its use. The importance of the policy level is due to the role of public policymakers in the central and local governments in regulating the appropriate use and development of information systems for public administration.

Additionally, reorganization and/or improved organizational management is a basic response to problems with the use of technology. Therefore, departmental reorganization, centralization or decentralization of computing, changes in reporting procedures within or among departmental units, and staff retraining, are important issues in the use of technology in organizations.

This paper therefore aims to review the state of the art of information systems as it relates to local, regional, and national public administration; analyse major issues at both policy and managerial levels in government organizations; and based on the analysis, propose information systems development guidelines and selected areas of international technical co-operation to implement those guidelines in developing countries.

STATE OF THE ART OF INFORMATION SYSTEMS IN LOCAL AND REGIONAL ADMINISTRATION

Major Institutions Concerned with Information Systems in Government

All government departments are concerned with information systems, as sources, as agencies in charge of information processing, and as users. However, the following seven categories of institutions play a major role in government information systems: (a) departments in charge of administrative operations; (b) statistical offices; (c) mapping and land survey agencies; (d) libraries and documentation centres; (e) computing centres; (f) organization and methods office (administrative management agencies and management services departments); and (g) planning agencies.

The mapping and land survey agency (generally one agency for both functions), the agency in charge not only of mapping but of spatial referencing systems, plays a major role in public administration information systems. The organization and methods office, whatever its name may be, is usually in charge of administrative management of government organizations. As organization and information flows are closely related, the organization and methods office is often involved (or should be involved) in the development of information systems in public administration (e.g., Japan, Singapore, Senegal, U.S.A.). The planning agency is one of the main users of goverment information systems.

In several countries, one or two agencies at the national level are designated to regulate general policy and guidelines on information systems in local government, but this arrangement depends on the administrative setup of the country. However, it is desirable to link some information systems established in local government within a country. What and how to link also depends on the kinds of information and information systems as well as the administrative setup of the country.

APPLICATION OF INFORMATION SYSTEMS

Categories of Information Systems in Public Administration

1. Definition and typology of information systems

An information system is made up of a set of information organized in such a way that it serves clearly defined needs, human resources, and procedures (manual or computerized) to enter, store, process, retrieve, disseminate, and use that information. Information systems in public administration vary according to the administrative functions of the decision makers for whom they are built. The following categorization can be made of information systems according to their functions in public administration:

(a) Information systems supporting internal management functions of public sector organizations, such as personnel, finance, and budgeting;

(b) Information systems supporting regulatory and specific functions in public administration;

(c) Information systems supporting "public service" management functions; and

(d) Information systems supporting planning and policy-making

2. Information systems supporting internal management functions of public sector organizations

Every administration or public body has numerous management functions, and thus there are information systems for personnel, financial, budgeting, and treasury management. Additionally, information networks to facilitate day-to-day management of services involve office automation.

3. Information systems supporting regulatory and specific functions in public administration

In local governments, information systems are mainly applied to registers. An entity is generally identified by an identification number or identifier. Four main types of register are usually set up and administered by local governments: for residents; enterprises and establishments; buildings; and spatial units (e.g., parcels, street and road segments, blocks, and other geographical areas). In addition, there are registers for specific entities (e.g., motor vehicles). Decentralized registers, coordinated nationally, are also to be found, according to territorial extent and political and administrative structures and responsibilities.

The person register, in addition to the identifier, usually contains the surname, first name, date and place of birth, sex, civil status, next of kin, nationality, and address of each individual. The use of a national identity number raises questions of privacy. In some countries (e.g., France), the person register does not contain the address of the individual. The enterprise register contains, generally, details of the denomination or trade name, date of creation, legal form, address of registered offices, legal statutes, and nationality of each legal entity. Establishments, agencies, and branches are identified according to the legal entities to which they belong, and their addresses are included in the register. The building register contains the identification number, date of completion, spatial location (parcel number and address), and physical data about the building. Each unit within the building may be identified. Building identifiers may be used as spatial identifiers. Spatial registers are registers of parcels, segments (streets and roads), and blocks, which generally contain an identifier, the corresponding street or road address(es), and coordinates of significant points.

Geocoding or geographical (or spatial) referencing systems, make it possible to allocate to an entity (such as an establishment or a power station) a geocode, i.e., a code which locates the entity. As only the coordinates (x,y) indicate precisely the location on a map, geocoding systems give the correspondence between specific spatial entities such as areas (parcel, block, and village), segments (street or road segment), and coordinates. Therefore, the parcel, village number, street address, or road segment number of an entity indicate more or less the precise location of that entity.

Most countries in the Asia and Pacific region have procedures for the registration of large, medium, and even small enterprises; they also have procedures for the registration of land. The United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) study group on government information systems recommends more vigorous applications of information technologies for registers of individuals, enterprises, buildings, land, and roads.1/

Other information systems in this category include legal information systems, fiscal information systems, social security and employment information systems, police and security information systems, and other sectoral information systems, such as those for education, motor vehicles, drivers' registration, and communication. Police and judicial information systems are usually quite distinct, despite their overlapping interests, because of their dependence on the executive and judicial powers. In many cases, the different police forces have their own autonomous information systems, that may be linked to one another. A public health information system aims at providing the authorities with all the information necessary for the implementation of a public health policy. For a specific population, it contains details of vaccinations, mortality, causes of death, genetic relationships, and the results of various prevention campaigns. It provides a permanent population profile from information collected at birth, and from schools and the army, and thus constitutes an embryonic medical file. As regards education, information systems relate to teaching personnel and their qualifications, costs, teaching establishments, students and their scholastic records, and management of educational establishments.

4. Information systems supporting "public service" management functions

Information systems in this category are service-oriented and include those in public transport, financial institutions, postal services, telecommunications, public utilities, and radio and TV services.

Telecommunications (e.g., telephone and telegraph) information systems concern network management (information on communications, equipment, availability of circuits, traffic analysis, saturation points, work underway or proposed, and assignment of technical personnel) and subscriber management (information on service demands, automatic billing, payment control, and different kinds of subscriber research). Information systems for distribution of water, gas, and electricity are allied with those for telecommunications insofar as they apply to network and subscriber management. Automated radio and television information systems are systems for frequency allocation.

Information systems on communications cover the technical, financial, and economic (e.g., rate of use) details of communication routes (roads, railways, waterways and associated bridges, viaducts, tunnels and locks), airports, and transport energy installations. They also include information on maintenance, repairs, and changes which have been carried out, or are underway or projected.

A hospital management information system covers both administrative and medical matters for patients in hospitals or undergoing treatment (identification, previous stays, medical steps taken and results, medicine supplies, and prescriptions). It leads to a medical file for the hospital concerned. Efforts are underway to integrate the various medical files thus created, though not without considerable moral objections. There is an attempt to develop also information systems for optimized management of resources (surface and air transport medical teams) and for early warning concerning diseases and epidemics.

5. Information systems for planning and policymaking

Planning and policymaking require simultaneously different categories of information: technological information, legal or other juridical information, domestic and foreign statistical data, individual data (e.g., on enterprises), other bibliographic information, and forecasting and decision making models. Planners and policymakers thus use: scientific and technological information systems; juridical information systems; and socioeconomic information systems.

(a) Scientific and technological information systems

Scientific and technological bibliographic systems answer the following types of questions: What documents have been published on a given subject, by whom, and where are they available? What research on a given subject is being carried out, where, and by whom? Standards and patents information systems are being used in many countries and at the international level. Examples include the World Intellectual Property Organization (WIPO) system on patents (IMPADOC), the various standards data base, and the Canadian data base on terminology.

(b) Juridical information systems

Juridical information systems aim to provide political and legislative authorities, administrations, magistrates, jurors, and lawyers with a system drawing on different legal sources: legal or regulatory texts, doctrinal publications, jurisprudence, and customs. Examples of juridical information systems are the système LEX (Sécritariat Gíníral du Gouvernment) and the système CEDIJ (Ministère de la Justice) in France.

(c) Supply-oriented socioeconomic information systems

Socioeconomic information systems may be divided into three main categories: (i) information systems based on a wide-scale data collection operation for statistical purposes (e.g., a population census and all the procedures and methods for handling the resulting data and using them to compile statistical tables and other presentations of aggregated data, such as thematic geographical maps); (ii) geographical information systems which usually give access to aggregate data on small geographical areas (villages, municipalities, and street blocks in an urban area) and make it possible to obtain the same information on broader geographical areas (rural areas and districts in an urban area) by aggregating the data, and to compare different areas, which are particularly used in planning public facilities; and (iii) chronological information systems which handle chronological series (for example, on production, consumption, and investment) and make it possible to establish correlations and projections.

National socioeconomic time series data systems have been developed during the last ten years in many countries. They combine macroeconomic data and are used both by government and the public. Examples of such systems are CANSIM (the Canadian socioeconomic management system, developed by the Canadian federal statistical agency, Statistics Canada), which has more than 30,000 time series and includes the necessary software allowing access to and treatment of the data); SUSE (Système unifií de statistiques d'enterprises, France); and CHRONOS (Economic and social time series on European Economic Community countries).

The information system should be able to provide information at both microeconomic (enterprise and establishment) and macroeconomic levels, including the sectoral level (allocation of investments and business indicators); regional level (links with population, employment, and investments); and national level (aggregation of regional information). This system, established at both the microeconomic and macroeconomic levels, makes fairly considerable demands on other information systems (social security, population, and fiscal systems). The agricultural sector, in particular, according to its relative importance, may have a subsystem within the economic information system. Depending on public administration systems, certain socioeconomic information systems should be able to provide information at various sectors and administrative levels. Local government information systems can be linked to a national information system.

Information banks for public access and use are another example of "supply-oriented" information systems. A few examples are (a) information banks for enterprises for market analysis or for the location of plants and other units (for example in the U.S.A., Data Resources Inc.); (b) information banks for individuals and households -- employment banks (for example, Agence Nationale pour l'Emploi in France), housing banks, prices of consumer goods per commercial unit, and technical data on consumer goods (consumer associations -- for example, Institut National de la Consommation in France).

Systems giving access to aggregated socioeconomic data and reports make existing reports, statistical tables, and maps, available to planners, decision makers, and research workers. Dissemination is generally through various departments and agencies for regional development projects. Such systems require systematic and standard descriptions of any report and table at its disposal; centralized storage of descriptions; and retrieval (and listings) by means of a document handling software. These systems can be organized at the local, regional, and national levels.

User-oriented information systems to assist in planning and strategic decision making are built to match well-defined needs for planning and decision making, generally at the sectoral level. They give access to data on existing censuses, on medium- and long-term needs, and on related costs. These systems are expected, in the long term, to make an essential contribution to development. The data to be organized in the data base, as well as the data base structure, have to be designed according to planners' needs.

To illustrate, an information system for integrated rural development is being prepared in Sri Lanka as a joint pilot project of the Government of Sri Lanka, the Economic and Social Commission for Asia and the Pacific, Data for Development, and the United Nations Educational, Scientific and Cultural Organization (UNESCO). It will include information on technology and socioeconomy, a geographic base file, individual data from censuses and surveys gathered at the national and local levels, individual administrative records, and statistical data aggregated at the smallest administrative area level. Relevant data will be stored and made accessible at the district level, the national level, and even at the intercountry regional (ESCAP) level. An essential feature of this project is that information could be fed back to a wide community of users at the grass-roots level.

Other user-oriented systems include control systems, project monitoring, and project evaluation systems. Control information systems are systems for decision making in the short term. A good example is given by flood forecasting systems, essential in some countries, such as the flood forecasting system used by the Government of India. Project monitoring and evaluation systems are needed for the managing agency to have access to the necessary data to monitor the project and, later to evaluate its results after the project is launched.

Current Information Technologies

During the first phase of computerization in public administration, information technology has been costly, needed skilled personnel, and brought dependence on the technology manufacturers. Current technologies are generally less costly, much more flexible, and skills they require can be acquired in a short period of time. They are more user-oriented. Their use meets the requirements of the sociopolitical constraints in many developing countries. They facilitate decentralization. They are network-oriented, which means that their use is consistent with the government data network approach. Additionally, they tend to break the previously well-established differences between the various types of information and to consider only information sources, information bases, and information flows, whatever the type of information may be.

1. Micro and minicomputers

In the last few years, there has been a remarkable increase in the variety of computers available. There are about ten times as many manufacturers as there were ten years ago. This is principally because of the development of micro and minicomputers, which cost only about a tenth of what comparable machines cost previously (for a professional micro from US$400 to US$20,000). So much less capital is required to develop information systems. Each administrative unit can have its own microcomputers. They can be linked to larger computers for more complex processing routines. The pilot project for the establishment of a data system at the divisional level for village-level planning and rural development in Sri Lanka's Kalutara district, for example, is based on the use of a microcomputer at the district level, enabling the local administrators and planners to process locally their own data. The microcomputer will be linked to central computer facilities in Colombo.

2. Data base management systems

In the past, data base management systems were costly to implement and use, and needed large computer facilities. Data base management is now spreading widely, due to a tremendous decrease in the cost of microcomputers.

3. Communications networks

Many countries have built specific communication networks for data, allowing a much bigger data traffic (e.g., the TRANSPAC network, used in France, which has access points spread all over the country). The cost of using the network does not depend on the distance, as in the case of the telephone, but on the quantity of data going through the network. Such communication networks using satellites can be a solution to data communication problems.

4. Facsimile

Facsimile is spreading widely, and in developing countries, facsimile can be used to collect data on preestablished forms, e.g., at the village level, and send them directly from each village to the district or state level, periodically.

5. Videotex and teletext

Videotex and teletext generally use the same standard (e.g., French standard: Antiope). They are used mainly for public access to data banks and for electronic mail. An example of public access to a data bank can be found in the French interdepartmental videotex data base, which contains more than 10,000 pages of information constantly updated for day-to-day use by individuals and enterprises. Electronic mail through videotex consists of sending messages between two terminals.

6. Word processing and teletex

Word processing machines are widely used in public administration. Their use increases the productivity of secretarial work by more than 30 per cent. But they are not only "intelligent typewriters"; they also have more refined applications. They can be connected to each other, which makes possible the exchange and teleprocessing of texts. This is called teletex (a very different technology from teletext) and is a means of instantly transmitting paper mail.

7. Local networks

Local networks are a new technology which offers the possibility of replacing circulation of paper by the circulation of electronic information. They can be used to communicate within a few hundred metres, e.g., between the offices of an administration within a building.

8. Micrographics

Micrographic equipment serves to record, store in a very compact form, and display large quantities of information found on documents. In Kuwait, for instance, a number of micrographics-based information systems have been developed for improving the records management of various government agencies. Micrographics-based information systems can be linked to computers, either directly or via an indexing system which speeds up the location of documents of interest.

9. Laser Disks

The engraving and reading of a plastic disk by laser beam is now a competitive mass storage technology. It has however given rise to two distinct storage media depending on the coding of the information stored (video images or digital information).

10. Office automation

Word processing systems and local networks complete the set of information technologies (texts were previously difficult to process), together with audiovisual systems. These technologies are now the basis for changing the work and procedures in public administration. An example can be given with what is now called "office automation." It is not a technology, nor a science, but it is a synthesis of all information technologies applied to office work. The concept of office automation implies that the organization of office work and therefore the organizational structure of a service can be redesigned by making the best possible use of available technologies, taking into account the objectives and functions of the service and the capacities and desires of the personnel.

11. Decision support systems

Decision support systems (DSS) are software packages that incorporate a wide range of tools for the end user manager. The most common DSS applications include forecasting, financial planning, planning models, and operations analysis.

12. Expert systems

Expert systems bring the techniques of artificial intelligence to bear on practical problems. Today expert systems exist in many fields, such as medical diagnosis, estate planning, geology, medicine, engineering, and computer hardware design.

POLICY ISSUES

Having reviewed the state of the art of information systems and technologies applied in public administration, an analysis of the issues which were observed in four case studies (Japan, Senegal, Singapore, and the U.S.A.) will be made, with a view to enhance the effectiveness of information systems in public administration, and to minimize the economic and social costs of such systems. Local or central government can play a crucial role in formulating policies on information systems, supporting legislations, programmes, and regulations, and establishing institutions which would advise and/or support information systems development. As such the issues discussed in this section are mainly addressed to senior public managers in government.

APPLICATION OF INFORMATION SYSTEMS

Institutional Arrangements

Need for a central focal institution

Rational formulation and implementation of government policies on information systems for local or central government, require appropriate institutional arrangements. Each local government formulates its own policy and guidelines to apply to the specific circumstances and choices of the local residents. Whatever these institutional arrangements may be, there should be a central focal agency. In Japan, at the central government level, the responsibility is assigned to the existing Administrative Management Agency of the Prime Minister's Office (as of July 1984, Administrative Management and Coordination Agency) and, at the local government level, it is assigned to the Ministry of Home Affairs, which promulgates guidelines for local government policies. In Singapore, the National Computer Board was created specifically for this purpose in August 1981 as a statutory board under the jurisdiction of the Ministry of Finance. In Senegal, the Comite National Informatique (CNI) was created to define and implement information systems policies, while the existing Bureau Organization et Methodes (BOM) of the President's Office, handles consulting activities. Government agencies responsible for information systems should be located at a high-level, for negotiating matters of policy or coordination with the other organizational units.

Functions of a central focal institution

There are three important functions which must be performed by a central focal institution: (a) development of information systems policy; (b) coordination of planning and management of information systems throughout the government agencies and departments; and (c) provision of technical advice and support services related to information systems, possibly including the management of a national computer centre. These functions may be vested in different agencies under the overall policy direction of a single agency or assigned to a single agency.

1. Policy development

In many cases, the first task falls to a high-level interagency committee or council, constituted by representatives of all concerned agencies. Such committees should be serviced by the secretariat of the central coordinating agency. In Austria and Costa Rica, these committees include experts from the private sector as well as representatives from all the ministries. In Japan, interministerial councils are held on policy matters. Additionally, a corresponding officer at technical level in charge of information systems development in each organizational unit should be appointed to coordinate policy matters with the central focal institution.

2. Coordination of planning and management

Coordination of planning and management across agencies is vital. The central focal institution usually assigned for coordination among organizational units may include such major activities as:

(a) Surveys of computer utilization;

(b) Allocation of budget for research and development on information processing;

(c) Review of procurement plans, organizations, and personnel requirements;

(d) Promotion of efficient utilization of computers;

(e) Promotion of multipurpose use of government data;

(f) Planning of advanced information systems for public administration;

(g) Interministerial computer centre to be shared by various ministries;

(h) Training of computer personnel;

(i) Formulation of regulations and policies on data security and protection of privacy and their monitoring.

Alternatively, a central statistical agency may be asked to combine the above activities with its technical role (e.g., the Central Statistical and Data Processing Office (OCEI) of the President of Venezuela).

3. Provision of technical expertise

Technical expertise can be provided through a separate institution, such as the National Institute for Business Management (NIBM) in Sri Lanka; by specialized agencies, such as the U.S. National Bureau of Standards (NBS) or the General Services Administration (GSA); or even by highly specialized groups, such as the Kuwait Information and Microform Centre (KIMIC). For instance, in 1982 the French Government established, as an independent administrative body, a Centre for Studies of Government Information Systems (CESIA). In Japan, the Local Authorities System Development Centre was established in 1975 to provide technical activities to the local governments.

Setting Information Systems Goals and Priorities

Priorities set as part of the planning process influence the type of information systems to be developed. To avoid overly ambitious goals, a reasonable approach would be to target high priority areas for information systems development — planning, tax, accounting and budget, personnel administration, or statistical processing.

One project could be selected on a pilot basis so that the use of information systems could gain visibility among government workers and so that staff members could gain experience in designing and using them. The decentralized planning information system in the Kalutara district of Sri Lanka is a project of this type. In another highly successful effort, the Government of Singapore, through the 1981 National Computer Board Act, instituted a programme designed to speed up computerization on a national scale. A US$100 million dollar programme over a three- to five-year period was designed to computerize the civil service and have spill-over effects to the private sector.

Assessing the Existing Information Systems and Computer Resources

One vital, yet most often nonexistent, type of information required for developing information systems policies is information on existing information systems and computer resources in public agencies. Such a survey could be under the charge of a high-level working group, or could be performed with external technical assistance, as in the USAID-funded study currently underway in Costa Rica. Statistics on the growth of computer utilization in government can serve as a surrogate indicator of the proliferation of information systems in general.

Information Systems Planning and Review

Government policy should encourage information systems planning and sound management practice. However, in a rapidly changing technological and political environment, it is difficult to plan very far in advance, for example for five years, which is generally accepted as the optimum planning period. In the U.S.A., the Paperwork Reduction Act of 1980 established an overall management structure for information resources management that placed emphasis on planning, and assigned to the

Office of Management and Budget (OMB), the General Services Administration, and the federal agencies specific management responsibilities. Implementing policies and regulations are now being revised in the U.S.A. to reflect this overall structure.

Government agencies should ideally be required to prepare on an annual basis:

(a) A statement of the information processing requirements of the agency, based on priority needs of the agency; and

(b) A plan that identifies the agency's approach for satisfying information system requirements for the medium-term (i.e., up to five years) and also provides a general statement of longer range plans.

In addition, each agency should produce yearly a report on the past fiscal year and current year to date which would highlight the major uses of information systems in support of departmental programmes and activities, comparing actual use with previous plans, identifying any departure from these plans, and providing an assessment of services received or provided.

Issues on Decentralization of Information Systems

The issue of decentralization of information systems is mainly dependent upon political choices concerning the organizational structure of national public administration (for sectoral and geographic decentralization). Other important factors are technical (availability of communications facilities) and economic (costs of communication, CPU, and personnel).

The emergence of the distributed information systems, due to recent development in software and hardware, makes it possible at reasonable cost to benefit from both advantages of consistency (in the centralized model) and flexibility (in the decentralized model).

In some countries, the trend towards decentralization has been fostered by the pressure of users complaining about the lack of centralized processing services. For instance, in 1976 the Comite National Informatique of Senegal was faced with mounting user concern over the existing policy of centralization (established in 1972). The event led to partial decentralization in which the data files and processing facilities remained centralized, but the data capture and editing functions were decentralized. A similar situation in Singapore in 1979 resulted in a complete policy reversal from centralization to decentralization of computer facilities.

Effective decentralization, however, requires some centralized coordination, if not control. Without this, redundancy in data collection, systems development, equipment, and staff can result in increased costs over the centralized alternative. Or, incompatibilities in equipment or systems can become a barrier to agency, or government-wide, reporting. The case studies reported successful systems operated in the centralized mode (e.g., Austria's customs administration and Kuwait's census processing system) as well as successful decentralized systems (e.g., Sri Lanka's planning system and Venezuela's control system).

Uniform government policies are therefore required to set minimum (and not maximum) standards and encourage compatibility to profit from information systems and technological development, e.g., microcomputer development. With this approach, the use of microcomputers can be encouraged as an ideal way of increasing administrative managers' productivity. In Singapore and the U.S.A., for example, ministries and departments are encouraged to acquire microcomputers where their use could lead to improved productivity. The microcomputers enabled personal initiative in sections and units of departments for promoting personal productivity in operational systems, e.g., inventory control and financial control. With the computer serving as a personal tool, decisions concerning application rests largely with the individual staff, rather than the management or central computer centre.

Promotion of Methodologies

Use of common methodologies may favour cooperation and exchange of experience as well as human and material resources between agencies. Furthermore, a clear definition of the steps to be followed in the life cycle of information systems is a prerequisite for an adequate system evaluation or audit. In this respect, the central guidance agency, with the support of adequate technical expertise should promote the use of a set of consistent methodologies for systems planning, design, and implementation.

For instance, in France, the Ministry of Industry sponsored the development of: (a) a methodology for administrative information system planning (RACINES); (b) a methodology for information system design (MERISE); and (c) a guide for taking into account employment and working conditions issues (ACTIF), which are widely used both in the public and the private sectors. In Canada, the central government agency responsible for information systems developed and recommended the use of the Canadian Systems Directorate's Systems Life Cycle Process (SLCP).

In addition, some kind of simple "cookbook-like" tools should be made available to managers on definite topics, such as "the choice of microcomputers" and "the introduction of word processors." For instance, the Swedish central agency responsible for information systems for central government has issued a significant number of these brochures which are widely disseminated within the government agencies.

Sharing Facilities and Information Exchange

Sometimes it may be more efficient for government agencies to share information systems and/or data. Administrative information systems are frequently similar in their structure although they handle different types of work. It would seem obvious to organize uniform systems and implement them in association with appropriate users. In this way, parallel administrative impediments are avoided, administrative expenditure is reduced, and the resources are used efficiently. Policies and programmes are necessary to encourage the sharing of computer resources. Standards in data definition and structure are prerequisites for information sharing between agencies. The development of standards for information systems software, hardware, and development procedures is another way of promoting sharing among departments and agencies. In the U.S.A., the federal standards programme is credited with increased sharing of data, software, and equipment. In Singapore, the data base on citizens, maintained by the Ministry of Home Affairs, is also used by the Elections Department and law enforcement agencies; and the Statistics Department of the Labour Ministry provides the Ministry of Trade and Industry with data from its information systems for manpower and economic planning.

Computer networks and the availability of a central processing centre can encourage resource sharing and reduce processing costs. The Central Computer Services Department in Singapore provides computer services to ministries and departments which are too small to justify their own computer installations. In Costa Rica, a distributed processing network has been set up among different entities. The Central American Institute for Public Administration (ICAP), a subregional intergovernmental agency, has interconnected its microcomputers with the mainframe computer of the Costa Rican Institute of Technology. The large central computer will be used to process bibliographic data base applications that would have overburdened the microcomputers, thus eliminating the need for ICAP to buy larger and more expensive devices.

National Policy Guidelines on Employment and Working Conditions

Employment and working conditions address various issues raised by the impact of the introduction of information technology in public services. The employment issues deal with modification of qualifications and possible short-term and long-term impact on employment and salaries. Many policy-makers and leaders in developing countries argue that use of technologies results in gross unemployment. Another argument is that new technology generates new jobs and rearranges employment without aggravating unemployment problems. A more valid argument is that computerization is imperative considering the bulk of works in public services and the demand of quality and productivity improvement in the public sector. No valid data was submitted to this study concerning the actual unemployment caused as a result of use of technology in public sector organizations. The working conditions issue deals with ergonomy as well as some other factors facilitating the acceptance of the new tools by the staff.

Issues Related to Laws on Information

Most countries already have regulations and laws regarding information use, processing, and dissemination, such as "statistical disclosure," "public archives acts," or copyright regulations. In the past ten years, a new concern on information has been fostered by the increasing use of computers, which has materialized in "privacy acts," "transborder data flows," and security issues. On the other hand, "freedom of information acts" which have been enacted in many countries, establish the right of citizens to access, and in some cases to amend, administrative information.

1. Security. Concern over information security has led to regulations that address information systems design, personnel, operation, and data transmission.

2. Privacy. The provision for privacy of data normally involves legislation and administrative guidelines for ensuring that "the collection, maintenance, and dissemination of information by the government is consistent with the laws relating to confidentiality" (e.g., U.S.A). Many countries have legislation similar to Austria's Data Protection Act which guarantees confidentiality of personal data provided one's interest therein is judged reasonable. Monitoring power is vested in the individual's right to see and challenge personal information and, in Austria, by two specific monitoring bodies -- the Data Protection Commission and the Data Protection Council. A most controversial case is the national individual identification number which information systems can use for various

administrative purposes. Easy access to data on individuals from various administrative offices make public administration extremely efficient. However, a crucial risk arises as to the protection of the privacy of individuals, and to what extent the data can be retrieved. Different mechanisms of securing privacy have been devised in several countries.

3. Public information. Much of the data gathered or information compiled by government agencies is, however, legitimately of interest to organizations and individuals outside of the government. Accordingly, legislation, such as the Companies Act (Singapore) and the Freedom of Information Act (U.S.A.) should exist to make information of interest available to the public. In addition, surveys and statistics on various subjects should be routinely made available to the public.

MANAGEMENT ISSUES

Management direction and control is necessary to ensure that information systems meet their objectives in terms of cost and quality and to ensure that the process of systems development is completed within a reasonable time frame. Perhaps even more important, since the policy and decision making activities of public managers rely on information produced by such systems, management must ensure that the systems developed are effective, i.e., that they meet the users' needs and they promote the objectives of the organization. This section, therefore, identifies and analyses the major issues regarding management of information systems in public administration, based on case studies submitted to this study from Austria, Canada, Costa Rica, Kuwait, Sri Lanka, and Venezuela.

The Importance of Functional (Nontechnical) Analysis and Design

The first step in an information systems development project should be the planning and requirement analysis conducted by users and systems staff, in consultation, if appropriate, with the supreme audit body. Traditionally, the bulk of time and money spent on the development of an information system was spent during the last three phases -- the actual construction of the system. Today, most methodologies favour more emphasis on the functional phases. This new emphasis reflects both the importance of the early design work to the success of the system and the increased availability of prepackaged software. In the Canadian case, for example, 70 per cent of the time and 49 per cent of the staff resources were spent on systems analysis and design.

Information Systems Project Staffing

The composition of the project team, that is the proportional representation of systems professionals vis-à-vis systems users, is important than the size of the team. The users' role, especially in the first project phases, cannot be overemphasized. Early managerial involvement in information systems planning and development will ensure that the information systems objectives and those of the agency or management are coincident and that overall government objectives regarding information systems are met.

The Importance of a Formal Information System Planning and Development Procedure

Information systems development (or improvement) can be more effectively undertaken following a formal procedure or methodology. A formal methodology provides guidelines, based on the experiences of other systems developers, for the systems development process. These guidelines provide managers who are new to the process with a checklist of steps that should be taken and questions that should be answered. While each methodology may differ in the number and names of the steps they describe, they all follow the same general pattern consisting of six broad phases of activity: (a) planning; (b) requirements analysis; (c) logical design; (d) physical design; (e) implementation; and (f) conversion.

Selection of Information Systems Hardware and Software

In most countries, the purchase of computer resources is subject to standard government purchasing regulations. Extensive regulation on procurement can, however, impede progress by making it difficult for user agencies to acquire compatible equipment (e.g., Costa Rica). A balance must be maintained between the indiscriminate acquisition of computer resources, on the one hand, and the barriers raised to compatibility and flexibility by overregulation, on the other. Guidance on hardware/software acquisition can be provided to user agencies by a central guidance institution or consulting agency. In Sri Lanka, the National Institute for Business Management provides such advice upon request.

User-Managers Management Control of Systems Planning and Development of Operation

At some point during the systems planning and development process, and after a system is in operation, costs and benefits should be evaluated and monitored. A report on systems costs, response time, volume of work processed, and other performance measures, should be reviewed continually by the user-manager to determine whether it is within expected response time and cost limits.

Education and Training

Continuing education and training are necessary in the field of information systems: First, training for information systems professionals; second, training for user-managers who will direct and control development projects; and third, training for users who are senior administrators who would participate in developing policy. Senior administrators' training is particularly relevant in developing countries, if information technology policy is appropriately devised in these countries.

GOVERNMENT INFORMATION SYSTEMS GUIDELINES AND TECHNICAL COOPERATION FOR DEVELOPING COUNTRIES

Proposed Guidelines

Reviewing the state of the art of information systems for public administration and the issues raised on both the policy and management levels, some conclusions can be drawn about the steps that should be taken by the governments of developing countries regarding the development and use of information systems. These steps are presented as guidelines in roughly the order in which they should occur. It is recommended that governments of developing countries should:

(a) Initiate development and implementation of policy on information systems;

(b) Establish institutional arrangements for information systems policy, management, and technical support;

(c) Require information systems planning at both central and agency levels;

(d) Support and encourage education and training in information systems at all levels (i.e., users, systems professionals, high-level public servants, and the general public);

(e) Provide incentives for the motivation and retention of skilled information systems personnel;

(f) Promote sharing of facilities and information exchange among government agencies; and

(g) Require that government agencies promote the use of a formal methodology for information systems development.

Priority Areas for International Cooperation for the Development of Information Systems in Public Administration

To assist developing countries in implementing the guidelines proposed above, there are a variety of possibilities for cooperation at subregional, regional, bilateral, and multilateral levels. The following areas of cooperation are suggested, involving developed and developing countries as well as technical and aid-providing agencies:

(a) International collection, dissemination, and exchange of information on resources which will help countries develop information systems in public administration, such as existing bibliographic reference data bases on information systems which could be made available to other countries, appropriate general purpose software, and training courses;

(b) Regional or interregional seminars to sensitize policymakers amd high-level government officials on the need to implement the above-cited guidelines;

(c) A survey of the state of development of policy on information systems in various countries, and the dissemination of such information for various purposes, including as inputs to the aforementioned seminars;

(d) Assistance to government training programmes for user-managers and systems personnel; and

(e) Assistance to local authorities in the development of methodology for the creation of information systems tailored to the specific administrative circumstances.

NOTES

* This paper is a summary of the proceedings of the United Nations Expert Working Group on Modern Management and Information Systems for Public Administration in Developing Countries held on 12-16 December 1983, and organized by the Development Administration Division, Department of Technical Co-operation for Development. The summary presents major issues in the application of information systems to local and regional administration. (See Appendix A for list of participants.)

1/ See ESCAP "Report of the Study Group on the Coordination of Government Information Systems on its Second Session, 2-7 February 1981" (ADM/CGIS(2)/5) (Bangkok, 1981).

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APPENDIX A. List of Participants of the United Nations Expert Working Group on Modern Management and Information Systems for Public Administration in Developing Countries, 12-16 December 1983

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Chapter 5

INFORMATION TECHNOLOGIES IN GOVERNMENT: ORGANIZATIONAL AND MANAGEMENT ISSUES

David Moskovitz and David Mammen

INTRODUCTION

At the Institute of Public Administration (IPA), we have been interviewing elected officials and professional staff of state, county, and local governments in the United States concerning their use of information technologies for a wide range of applications, including urban and regional planning. Our definition of information technologies is broad, and includes computers, advanced telephone systems, data and voice networks, video and cable broadcast systems, electronic mail, and cellular communications.

It is clear that governments are spending more and more on these technologies and are becoming increasingly sophisticated users. This is true in the practice of urban and regional planning, as it is in a number of other fields of contemporary public administration. For example, municipalities within the United States have developed sophisticated geographic based support systems which facilitate computerized tracking of streets, street and traffic lights, sewers, and road repairs. These systems provide administrators with information and control which were not available under manual systems. Easy access to this information has been of great assistance to municipalities in the day-to-day maintenance of the physical urban infrastructure.

Our research suggests that the ability of governments to develop and implement information systems for urban and regional planning, or for any other purpose, will require coping with a number of trends in the marketplace and in technology which are presenting new problems and challenges. These trends include decentralization of computing power, the convergence of telecommunication and data processing systems, and increased opportunities to integrate different technological systems.

The first part of this paper examines these trends, and their implication for governments' use of information technologies. The second part of the paper examines organizational issues (the assignment of responsibility and authority for controlling the procurement, allocation, and application of technologies) and human resource issues (the people who develop, use, and manage technologies) which will affect the ability of governments to cope with these trends. While our research is U.S.-based, we believe the trends and issues we have revealed are relevant to the experience in other nations as well.

Expanded Use of Microcomputers

With large, centralized computer and communication systems, users typically must obtain the products they require by interacting with programmers and systems analysts. The expanded use of microcomputers has changed these relationships. Many offices can now afford powerful microcomputers for use in word processing, financial modelling, and data base management. The growth of microcomputers is putting tremendous computing power into the hands of end-users (those who actually apply the technology in their daily work) who may require limited support from data processing professionals. Some microcomputers available today have power comparable to mainframes developed five years ago, yet end-users can essentially teach themselves to use powerful software packages.

The use of information technologies is thus becoming increasingly decentralized. While the need for mainframe computers will certainly not disappear, technological developments will continue to give nontechnical users increased control and sovereignty over their own computing environment. Nontechnical managers are now less dependent on technical support personnel and more in control of both the technical and human resources necessary to implement a system.

Yet decentralization brings problems as well as opportunities. In the past, centralization provided some assurance of quality control, technical competence, and system compatibility. In a decentralized environment, this is no longer the case. A new community of users now has the opportunity to make decisions about the procurement, development, and use of information technologies.

The Convergence of Telecommunications and Data Processing Technologies

Another trend is the obscuring of distinctions between technologies. One example is the distinction between mainframe, mini, and microcomputers, described above. Another is the relationship of data processing and telecommunication technologies. Data transmission has historically been handled by data processing technicians, while telecommunications (mainly voice communications) have been handled by telephone coordinators who order phone service from a single supplier (the Bell System) and monitor telephone billing.

A veteran county data processing official characterized the traditional separation as well as the pace of the change when he revealed that "up to two weeks ago I thought telecommunications only meant the transmission of data." In fact, data processing and telecommunications technologies have been converging for over a decade, and the trend has accelerated significantly in the last five years. Today voice and data can be transmitted over the same transmission path and digital computers can handle both kinds of communications. Speech (an analog signal) can now be converted to digital form; thus voice communications can be handled by sophisticated computers. The private phone systems which many governments are installing (often referred to as PBXs) are really specialized computers that can handle voice communications. The latest generation of PBX equipment is also able to handle data communications.

At the same time that voice communications are being increasingly handled by computers, it is becoming more important for computers to communicate over long distances with end-users and other computers. Many organizations are linking microcomputers together through local area networks or attempting to establish micro to mainframe computer connexions. These "smart" networks are becoming integral parts of the computing environment. These networks are now controlled by computers that perform functions (like protocol conversion) which previously were performed by host computers. The importance of sophisticated networks will continue to expand. With the trend towards microcomputers and decentralized data processing, networks offer the opportunity for disparate users to share and exchange information.

In the United States, the convergence of telecommunications and data processing technologies has been accelerated by the divestiture of the American Telephone and Telegraph Company. The breakup of the phone company's monopoly has caused both public and private organizations to rethink the way they meet their basic communication needs. This is especially true of governments which previously could purchase directly from AT&T, but must now competitively bid for basic services such as phone installation and repairs. What telephone systems should governments buy or lease? Should governments purchase their existing phone systems? How can governments assure that residents and businesses in their jurisdiction have sufficient lines for both voice and data transmission? What opportunities do cellular (mobile) telephones and new computerized two-way radio systems offer for remote management and administration? Many governments in the United States are now faced with questions such as these for the first time.

The Importance of Integrating Technologies

As the number of automated functions within a government organization increases, new opportunities to more productively use information begin to unfold. This increased productivity results from applying information in novel ways. Governments are starting to realize that once information is in machine readable form, new methods of applying this information become possible for the first time.

Two examples help illustrate this trend. In New York City, the Finance Department (the agency responsible for collecting the City's taxes) has initiated a joint programme with the City's central purchasing division to track down businesses that are delinquent on their taxes. The Finance Department maintains a computerized list of delinquent businesses, and the purchasing division maintains a computerized list of all vendors who supply goods and services to the City. By matching these lists, the Finance Department can stop payment to delinquent vendors for goods and services until the vendors have fulfilled their tax obligations.

A hypothetical example illustrates the benefits that can be achieved when one agency is able to access other agencies' computerized information. A fire truck equipped with a portable computer terminal responds to a fire in the warehouse section of the city. With the ability to call up information from computer systems of other agencies, fire personnel responding to the call have instant access to information which could be critical in battling the fire. This information might include data from a number of different city departments or bureaus, and require the integration of different systems and technologies:

Information	Organizational Responsibility
Arson and/or False Alarm History	Fire Department
Owner of the Building	Buildings Department
Type and Number of Occupants	Housing Department
Structure and Composition of Building	Buildings Department
Storage of Toxic or Flammable Substances	Environmental Protection

Another more hypothetical example illustrates the benefits that can be achieved through interdepartmental coordination of system development. Computer aided design (CAD) systems are becoming important tools in building and maintaining a region's network of subsurface utilities. Water and sewer pipes, electric and telecommunications conduit, and other underground structures can be mapped onto a unified CAD system that provides a comprehensive view of a city's and a region's subsurface infrastructure. A unified system of this type can prove indispensable in planning new construction, making repairs, and preventing accidental damage. Technically, this type of multidimensional mapping is not difficult. The more difficult hurdle may be assuring that the responsible units do not independently procure a CAD system and develop independent mapping strategies.

The benefits of system integration are real and increasing. As individual systems proliferate, the ability to share information programmes and technical expertise through the integration of systems will become even more important. A planning meeting held in September 1983 to discuss the U.S. Programme on Microcomputers in Developing Countries (Board on Science and Technology for International Development, National Academy of Sciences), identified a number of constraints to the use of microcomputers. The report of that meeting observed that "serious problems of compatibility may arise as French, Japanese, and other manufacturers start marketing and incorporating their machines in assistance activities."

But the technical issues of system compatibility are not the only issues that must be resolved. More serious obstacles may emerge from trying to bridge organizational issues. For example, can different agencies agree on standard definitions of data and common formats to store information? In the fire department example, each agency may store a building's address in a different way. In the finance department example, the two agencies may have different numbering schemes for tracking vendors. The challenge for governments is to recognize the linkages between different systems and to develop methods to bridge both the technical and organizational issues.

Coping with the Trends

These trends -- decentralization of computing power, the convergence of telecommunications and data processing technologies, and increased opportunities to integrate different technological systems -- are presenting new challenges to governments. The ability of governments to harness information technologies will require strategies to cope with these trends. The strategies may depend less on technical issues than on:

(a) organizational issues, having to do with the assignment of responsibility and authority for controlling the procurement, allocation, and application of information technologies; and (b) human resource issues, having to do with the people who develop, use, and manage information technology in government. These issues are discussed in the next section of the paper.

ORGANIZATIONAL ISSUES

Organizational issues relate to the control over procurement, allocation, development, and application of information technologies within government. To what degree is this control centralized or decentralized? Are the lines of responsibility different for different technologies? Are the technological distinctions still relevant? Has the current organizational structure emerged by design or default? These organizational and managerial issues will become increasingly important as governments become more dependent on information technologies.

Our research has not revealed an ideal organizational approach, nor have we constructed a "theory" of information management which would suggest the use of organizational design X in setting Y to achieve outcome Z. Rather, we are trying to build a framework for thinking about the relationships between organizational issues and the ability of governments to effectively apply information technologies, and highlighting the complexity of those relationships.

Organization by Technology

One perspective is to look at how different technologies are organized within the organization. It is common in government to find separate technical units responsible for managing and supporting discrete information technologies. For example, one unit may be responsible for managing the CAD system, another for microcomputers, and yet another for mainframe operations. This fragmentation of responsibility and authority often reflects the chronological development of distinct technologies. As new applications or technologies evolve, new organizational units emerge to support them. The result can be a patchwork organizational structure that is not well suited to the challenges of rapid technological change.

The organization of data and voice communications is illustrative of this split along technological lines. Advances in communications technology described above have reduced the technical differences between telecommunications and data processing, bringing into question the desirability of maintaining separate organizational units to handle these functions. The changing relationship between telecommunications and data processing intensifies the need for coordination on a range of important issues which include: (a) establishing links between micro and mainframe computers; (b) establishing telecommunications support for microcomputers; (c) establishing coordinated intra-building wiring schemes for both telephones and terminals; (d) purchasing integrated voice and data switching equipment; (e) establishing phone company by-pass strategies; and (f) training personnel.

Resolution of these issues requires the joint participation of data processing and telecommunications staff. However, the traditional organizational split between these two technologies can make this coordination extremely difficult to achieve. Those organizations that fail to bridge this gap will miss out on opportunities to increase productivity and save costs.

With computers, technological developments are creating important bridges between different technologies. As the interdependence of these technologies increases, the rationale for separate organizational structures to support them is weakened. Yet within governments, separate units may be responsible for the operation and management of mainframe, mini, and microcomputer systems. The expanded use of micro and minicomputers has encouraged the development of local support units which compete with more centralized data processing operations. Each unit may have its own bias towards particular equipment, vendors, or development approaches. In this arrangement, technical support personnel may become advocates for a particular technology, especially if they feel threatened by a newer technology. Rather than being able to turn to a single resource to solve a problem, the end-user is placed in the unenviable position of having to "shop" technologies.

In general, governments in the United States have tried two approaches to overcome this fragmentation along technological lines. One approach is to build an umbrella organization which brings together the different technologies under a unified span of control. While this approach provides the greatest opportunity for coordination and long-term stability, it can require substantial reorganization which can be difficult to bring about. An easier, interim approach has been to establish interdepartmental task forces. While the success of these groups in different organizations has varied, for the most part they offer the opportunity to open lines of communication and begin a more coordinated planning effort.

Degree of Centralized Control

A second perspective on the organizational structure is to look at the degree to which control over information technologies is centralized within the organization. Traditionally, the degree to which control could be decentralized has been limited by the available technologies. Large mainframes have been the only option, and the control of these resources has resided with data processing professionals. In this environment, users have been dependent on data processing staff to develop even the most simplistic application or to make the slightest change in a programme.

As discussed earlier, new software and hardware technologies are changing the relationships between users and data processing professionals. Clearly the microcomputer boom has placed new control in the hands of the end-user. Even in the mainframe computer environment the trends is towards "user-friendly" software. As the ability of end-users to develop and operate systems increases, the question of control becomes more important. To what degree should end-users be unfettered in their efforts to procure and develop systems?

Unlike mainframe or minicomputer systems, the potential for rapid growth of microcomputers within an organization is very real. The limits on growth in the number of terminals and applications under a mainframe or minicomputer system are imposed by the size of the system itself and by the size of the investment required for expansion. Microcomputers present a different type of resource allocation problem than do mainframe or minicomputers. Mainframe computers are a shared resource. Mainframes are limited in the number of users that can be supported at any given time, thereby creating contention between users for access to the computing resources. This contention requires senior managers to make decisions concerning the relative importance of one application over another. With microcomputers, on the other hand, computing power can be increased in small increments specifically suited to the needs of a particular unit; users need not contend with each other for resources. Without technical or economic constraints on growth, the burden of controlling the proliferation of microcomputers falls on the organization's management.

The trend toward decentralized computing power has the potential to intensify the fragmentation within organizations at a time when the technical feasibility and importance of integration is increasing. The irony is that while many governments are trying to encourage managers to take advantage of the benefits of automation, it may not be long before these same organizations are wrestling with how to control the growth of these systems. Unfortunately, for many governments the questions of standardization and control are not addressed until the problems of coordination, compatibility, and duplication have become obstacles to getting the job done.

While there are important benefits to local autonomy in the application of these technologies, there is also a need to ensure that the expansion of microcomputers occurs in a planned and coordinated manner. The challenge for governments is to strike a balance between giving end-users the opportunity to explore and benefit from this decentralized computing power, while still realizing the efficiencies of organization-wide coordination and standardization.

In order to achieve a balance between local autonomy and standardization, some degree of centralized support and monitoring of the use of these technologies is necessary. This monitoring and control function is often achieved through budgeting and procurement procedures. Some organizations have developed specialized approval processes that reflect the special nature of information technologies. Such processes are specifically aimed at monitoring the purchase and application of these products. For example, in New York City a separate unit was established in the Mayor's Office which is responsible for review and approval of all data processing related procurement including the hiring of consultants.

These procedures reflect policy decisions regarding who has the authority to purchase computer hardware and software, to contract with consultants for training or system development assistance, and to hire technical staff. Ideally, these procedures should reflect top management's preference as to the degree of local autonomy or centralized control that should exist. Different organizations choose to tip the balance in one direction or the other. The appropriate balance for any specific organization will be a function of its size, mission, organizational structure, technical competence and, perhaps most important, management style.

One possible approach emphasizes control. All purchases of hardware, software, and training, and all system development must first be approved by an oversight body. While this provides tremendous control and opportunity for system integration, it can be very time consuming for everyone involved. Government procurement procedures can be notoriously slow. By the time government is able to specify, order, and receive information equipment, the technology may have changed. The Grace Commission (a blue ribbon committee appointed by President Reagan to study opportunities for cost savings in the U.S. Government) estimated that it took the federal government as long as six years to complete the procurement of information technologies, compared with six months for private industry. Users often become frustrated by such a stringent policy, and the incentive to explore creative new applications can be squelched. In addition, even with the most rigorous budgeting and procurement procedures, this degree of control is very difficult to enforce. For example, frustrated users who are prevented from purchasing a particular software package will find an illegal "bootleg" copy instead.

Another approach sets standards and provides users with incentives to adhere to them. For example, a portfolio of hardware and software products that are readily available is maintained. Users selecting from these products have access to a full range of technical support including installation, training, application development, and trouble shooting. In addition, users can often receive faster delivery on these products because procurement contracts are already in place and the competitive bidding requirements have been fulfilled. Users are given the choice of purchasing supported or nonsupported products. Those users who purchase nonsupported products must accept the added risk and time involved.

At the federal level, the U.S. General Services Administration has opened a central computer centre where individual agencies can shop for hardware and software. Systems and parts are kept in inventory, and trained staff are able to provide technical assistance. Should local governments experiment with this approach?

HUMAN RESOURCE ISSUES

The best organization and procedures will not help government harness information technologies if government does not have the people it needs to develop, use, and manage these technologies. Human resource issues include recruiting and keeping qualified employees, providing training, dealing with displacement issues, and overcoming the fear of change.

Recruiting and Retaining Employees

Government has a great need for qualified technicians (required to design and operate systems) and planners, policy analysts, and managers (to manage information technologies). In many nations, a shortage of trained and experienced personnel may be the most important human resource issue. In the United States, technicians and technologically-literate managers are in great demand; government can find it difficult to recruit the human resources it needs. Salaries are usually the biggest obstacle. Government agencies often cannot match the salaries and fringe benefits offered by private industry, particularly for technicians in great demand. In a government setting, the ability to pay salaries sufficient to recruit qualified staff is not constrained just by budget limitations. Paying some people more because of market competition or technical accomplishment may require negotiations with unions, as it affects terms and conditions of work.

Governments also find it difficult to retain employees. Again, salaries are the biggest problem. People may come into the public sector at a fairly low level, but can rapidly gain experience and cash in on that experience by moving to jobs in the private sector. Retaining employees with technical training and experience is a particularly difficult task.

Salaries and fringe benefits are not the only obstacles to recruiting and retaining employees qualified to develop, manage, and use information technologies. Such employees are attracted by the opportunity to work with state of the art hardware and software. If government cannot provide these opportunities because of budget constraints or bureaucratic red tape, technically-inclined employees will find jobs elsewhere.

The constraints of public personnel systems are an equally important factor. In U.S. civil service systems, employees hold specific job titles which describe the work that will be performed and the requisite knowledge, skills, and abilities. Employees are hired (and usually promoted) from lists of candidates, with eligibility established on the basis of tests. But in many civil service systems, job titles are narrowly defined, leaving the employee with a narrow description of the work to be performed. Yet, the increasing decentralization of information technologies means that more and more employees have access to equipment and applications which a few years ago were the exclusive province of expert technicians. As microcomputers and telecommunications equipment proliferates, managers, professionals, and clerks increasingly do the work of systems analysts, programmers, and even data entry operators. For some employees this may result in their working "out-of-title."

This situation can present several complications. People can claim they are working out-of-title if they do not get a raise, or when they receive poor performance evaluations, because they are being judged on work that they are not supposed to be doing, according to their title. Employees may think that the work they are actually doing warrants a higher salary. Even if the supervisor agrees, a raise may not be forthcoming because the job title sets salary ranges. If there is no other way to get a raise, the employee may file a grievance. Managers may go along, and try to reclassify an employee in order to get him or her a raise. Alternatively, if a manager thinks an employee is not doing a good job and wants to fire the employee, the employee can make a good case that he cannot be judged on terms of work outside of his legal title.

Other problems occur when job titles are not updated to reflect changes in the nature of the work performed or changes in the requisite knowledge, skills, and abilities. Job titles that describe technologically-oriented work may reflect technology that is years old. The convergence of telecommunications and data processing discussed earlier is a case in point. For example, New York City government does not have accurate job titles for employees working on telecommunications issues. An old series of job titles emphasizes knowledge of telephones. These descriptions do not reflect the skills and abilities required today of telecommunications experts who in their day-to-day work perform tasks strikingly similar to data processing professionals. The City is forced to use computer-related job titles which more closely approximate the actual requirements of the job. Technology is changing so rapidly that it is all but impossible for civil service systems to keep up. This limitation of public sector personnel administration can have far-reaching impacts when jobs related to information technology are considered. Tests -- designed to measure skills required of the job title -- may be irrelevant to the work that must actually be performed.

The process of creating new titles and new job definitions that actually reflect the work that needs to be done, and the process of creating tests to measure those skills, is difficult, time-consuming, and expensive. Moreover, public sector personnel specialists responsible for creating job titles and constructing tests often are unaware of the technologies and work that need to be done. By the time new titles are developed (in consultation with employee unions) and new tests are designed, administered, and scored, the technology may have changed, the titles may be obsolete, and the people hired (or promoted) may not be right for the job.

Training

Another set of human resource issues concern training employees who will work with information technologies. At the planning meeting of the U.S. Programme on Microcomputers in Developing Countries, a number of training issues were identified as constraints to the use of microcomputers. These included the "lack of knowledge of how microcomputers can be used, lack of knowledge of what software is available and appropriate, and the lack of trained, knowledgeable practitioners."

Most training today is either of a technical nature (for example, specific operating systems, or programming languages or applications) or is aimed at making managers and professional staff "computer literate." Obviously, technical training is required. But the trend toward decentralization of technology means that a new community of users now has the opportunity to make decisions about the procurement, development, and use of information technologies. Key officials who may not have technical training are called upon to make major decisions concerning information technology. Both technical and administrative capabilities must be strengthened in order to harness information technologies.

Who should train? In-house trainers, or outside consultants? Technicians, or professional trainers? The choice may influence the topics, language, and direction of training. Professional trainers in government may not understand the technology; technicians may not understand training methods and dynamics. How should the training be financed? How should it be integrated with other training and development programmes? Is training available to all who think they need it, or does someone else decide?

The education of users of information technology must be continuing. Staying abreast of technological developments is a full-time job. Governments may need to think through how they find out about new developments in hardware and software, and how that information is filtered to users who need to know. When technology proliferates, individual employees may have more technical expertise on particular programmes and hardware than the "experts" in the office. There may no longer be only one repository of expertise. This can be threatening to those who have been in charge, and can change existing patterns of technical assistance and support.

Using Consultants

Governments faced with the opportunities and challenges of new information technologies may decide to seek expert help by hiring consulting firms to advise on various issues. Will the consultants be asked to advise only on narrow, technical questions? In the absence of a broad framework to guide the planning and management of information technologies, will the narrow technical answers be sufficient? How can governments evaluate their needs and find qualified assistance?

Emerging Human Resource Issues

New information technologies afford the prospect of the ultimate in decentralization: government employees working at home via computers and telecommunications. Civil service systems and existing work rules cannot generally accommodate this prospect. The possibility most often comes up in the context of maternity leave, but there is no equal opportunity. "Telecommuting" would be easier for professionals, because they do not have to depend on others to give them work to do (as do secretaries, for example). Of course, some jobs lend themselves to telecommuting, while others do not.

Telecommuting presents a number of managerial issues. Who would decide who could telecommute, and who could not? How would telecommuters be supervised? Do telecommuters feel part of the office, when they are not in the office? How can their productivity be measured?

Fear of Change

Another human resource issue is the potential displacement of employees who lose their job when the work they do is automated by information technologies. The fear of displacement is pervasive, and this fear must be directly addressed. Careful manpower planning is required in order to minimize any negative effects on existing employees. The goals sought by the use of information technologies -- increased productivity, greater efficiency, cost savings -- may conflict in some economies with other goals such as providing employment in the public sector.

The most challenging human resource issue may be overcoming natural fear of change (which can quickly become resistance to change if not well managed), so that new technologies are allowed to succeed. A thorough training programme which begins with the introduction of information technology into the office can help to overcome such fears, and encourage an open attitude towards experimentation and innovation. Involving employees in the design and implementation of systems can also go a long way towards overcoming the fear of change.

CONCLUSION

The trends described in this paper -- decentralization of computing power, merging of telecommunication and data processing systems, and increased opportunities to integrate different technological systems -- will continue to accelerate. The context and environment within which governments attempt to use information technologies will continue to change. In fact, continuing change may be the one certainty. The ability to cope with that change, and the opportunities and challenges it will present, is perhaps the key to making information technology work in government.

The missing element in many governments appears to be a planning process which can guide activities and decisions concerning information technology. The United Nations Expert Working Group on Modern Management and Information Systems for Public Administration in Developing Countries has emphasized the role and contributions of policy in the motivation and guidance of activities. The United Nations working group emphasized the use of a formal methodology for the development of information systems in order to provide guidelines, and recommended coordinating agencies which should be responsible for surveying the utilization of information technologies, reviewing procurement plans and human resource factors, and undertaking research on advanced systems.

Those with responsibility for making key policy decisions concerning the procurement, allocation, and application of information technologies — elected officials and senior management — must be part of this planning process. In the absence of such a process, decisions will be made ad hoc and by default by technical experts and individual users. To be useful, the planning process must interpret and make estimates on technological developments, balance the trade-offs between centralized and decentralized authority, and be sensitive to human resource issues. New organizational arrangements and administrative procedures may be required, but government must be wary of making information technology a new bureaucracy.

Chapter 6

MONITORING AND EVALUATION OF LOCAL AND REGIONAL PLANNING IN DEVELOPING COUNTRIES, WITH PARTICULAR REFERENCE TO METROPOLITAN REGIONS

Ian Masser

INTRODUCTION

The Planning Context

The main features of the planning context within which the following discussion of monitoring and evaluation is set are described by Taylor and Williams in their useful review of urban planning practice in developing countries.1/ They describe the traditional approach to urban planning developed during the 1950s and the shift away from this that has taken place since the late 1960s. On the basis of this evaluation, they make a number of suggestions for the development of urban planning practice that provide a starting point for the discussion of monitoring and evaluation.

The approach that was adopted to most urban planning problems in developing countries during the 1950s was based largely on comprehensive master planning ideas borrowed from architecture and engineering. This approach was characterized by the emphasis on the product, or the end state that was desired rather than the process or the sequence of actions that was needed to reach this end state. Plans produced using this approach were essentially long range in nature and contained little indication of the way in which development should be phased. There was also a heavy emphasis on physical issues such as land use zoning, building, and public works and, by comparison, relatively little discussion of the socioeconomic programmes needed to back up physical development programmes.

A very large number of examples can be found in the cities of developing countries of the application of this kind of approach during the 1950s and 1960s. In most cases where such an approach was adopted there is a marked discrepancy between the hopes of the planners and the reality that emerged as a result of the activities of sectoral agencies charged with the implementation of a wide variety of projects. This discrepancy reflects the extent to which decision making in connexion with these projects was governed largely by short-term considerations and the specific priorities of the sectoral agencies rather than the global objectives of the master plan.

Throughout the developing countries there was a general shift away from this traditional approach in the late 1960s towards another approach which was principally concerned with getting things done. In most respects, this new approach was diametrically opposed to the traditional master plan approach. As a result, there was a tendency too for long-term master plans to be replaced by short-term proposals that led directly to action. Financial and budgetary considerations play a central role in the formulation of proposals of this kind, and, as a result, there has been a tendency for planning practice to take on a more general policy orientation in which there is a greater emphasis on socioeconomic programmes alongside physical development projects.

Although the new approach has been more successful in accelerating programme implementation in the cities of developing countries, it is necessary to recognize that it suffers from a number of important weaknesses. The most important of these is that longer range and broader perspectives may be lost sight of in the rush to carry out feasible projects. Jakarta's kampong improvement programme is a good example of this in respect of the extent to which there has been a failure to recognize the need for citywide drainage, sanitation, and water supply strategies to be developed at the same time as efforts are being made to upgrade individual kampongs. Furthermore, these problems have been aggravated in many cases by a general lack of coordination and the inadequate nature of the networks that exist between different sectoral agencies within the same urban area.

Generally, the task of planning in situations of this kind is also made more difficult by the lack of operational information. The problems that this creates for planners and decision makers have been described by Edralin in the following terms:

> At present there is no operational regional planning information system in Asia. Various institutional arrangements are provided to perform data collection and monitoring functions. In the Philippines, for example, some sectoral agencies in the regions have research units; others have planning staff serving all other units. The development staff of the provincial, city, and municipal governments perform monitoring and information gathering functions, although the extent to which they become the local executives' primary source of information varies with

> the confidence the executives have in the staff. In Metro Manila, citizen's brigades in the urban barangays (the smallest official political unit) monitor progress on the implementation of metropolitan plans and perform feedback functions by reporting on violations of rules and regulations involving water and energy conservation, price control, broken installations, etc.2/

To overcome these limitations, Taylor and Williams have put forward a tentative model of urban planning practice for developing countries which seeks to maintain a balance between the formulation of long-term strategies and the development of short-term action programmes. This model assumes that planning is a dynamic and iterative process

> in which the planning agency attempts to move through the entire sequence of tasks, from description of existing conditions/trends, to formulation of long-range strategies, to development of specific five-year and annual action programmes, to the monitoring and evaluation of implementation.3/

Such a model describes not only the planning process but "the entire planning/programming/budgeting/implementation/evaluation and feedback sequence, in which 'planning' leans almost imperceptibly into 'implementation' — and back again to 'planning'." It represents an ideal to be strived for rather than a description of present reality in that there is very little hard evidence of the existence of such practices in the cities of developing countries. Nevertheless, this model indicates the importance that is attached to monitoring and evaluation as an activity by informed observers who also recognize the need to explore different means of bringing their ideals closer to reality. As such, these views provide the planning context within which the subsequent discussion of monitoring and evaluation takes place.

The Nature of Monitoring and Evaluation

In most of the management literature, the term "monitoring" is virtually synonymous with "performance review." For example, the authors of the United Nations sourcebook on Systematic Monitoring and Evaluation of Integrated Development Programmes view monitoring and evaluation as being primarily a device for improving programme management.4/ In their view,

> The main purpose of monitoring is to indicate as early as possible any shortcomings with regard to the delivery of inputs, execution of activities or production of outputs, in order that corrective measures can be undertaken in time.

Consequently,

> The term monitoring usually refers to the process of routine periodic measurement of programme inputs, activities and outputs undertaken during programme implementation. Monitoring is normally concerned with the procurement, delivery and utilisation of programme resources, adherence to the work schedule or progress made in the production of outputs.

Views such as these assume that monitoring is essentially concerned with the control of project implementation. In this case, the main tasks that are involved are associated with regular performance review. Such a view must be regarded as being rather narrow and restricted in the light of the preceding discussion which laid great emphasis on the need to take account of long-range strategic issues at the same time as progress towards project implementation. The need to view monitoring in broader strategic terms is repeatedly stressed in the urban planning literature on this topic. For example, the working party set up by the Scottish Development Department to give advice on structure plan monitoring stresses the importance of constantly reexamining the extent to which the assumptions that lie behind programmes are still valid as circumstances change. From this standpoint, the task of monitoring is extended to include the identification of new problems and opportunities as they emerge, in addition to the review of progress towards programme implementation.

> Monitoring is the activity of continually assessing the relevance of structure plans. It involves not only measurement of how far policies and general proposals are being implemented but also appraisal of the practical contribution that policies and proposals are making to the resolution of strategic issues and whether changing values or unforeseen problems and opportunities are indicating any need to modify existing policies and proposals or to put forward new ones.5/

With these considerations in mind, the working party defined four main operational tasks for strategic monitoring purposes:

(a) to demonstrate progress in the application of strategic planning policies and proposals;

(b) to assess their effectiveness in relation to key issues and main objectives;

(c) to test the relevance of strategic policies and proposals in the light of change; and

(d) to test the assumptions that led to the definition of the key issues and main objectives in the strategic plan.

In a similar vein, a report prepared for the British Department of the Environment by the Institute for Operational Research distinguishes between the monitoring of issues of concern, the monitoring of policies, programmes, and decisions, and the monitoring of uncertainties underlying future choices.6/

These perspectives reflect a basic difference between the view of monitoring and evaluation that has developed in urban planning practice and that of the management literature in general. The essential difference between these viewpoints reflects the assumptions that they make about the degree of control that those involved are able to exercise over their immediate environments. Performance review is of paramount importance when there is a very high degree of control exercised over programme implementation and the elements involved in the tasks are clearly defined and generally accepted by those involved. Under these circumstances, the information required for monitoring and evaluation purposes can be relatively precisely defined in advance and built into all project management structures.

In contrast, strategic planning takes place largely in situations where those involved are able to exercise relatively little direct control over their environments and their responsibilities are not clearly defined or even necessarily accepted by all those involved. Under these circumstances, it is much more difficult to identify information requirements and build monitoring and evaluation into management structures. A report prepared by the Institute of Local Government Studies (INLOGOV) for the British Department of the Environment sums up the position as follows:

> In strategic planning and control we are concerned with coping with a dynamic, imperfectly understood, and imperfectly controlled environment, encompassing an unlimited number of potential fields of interest. We are concerned here with the situation where 'management control' is no longer sufficient because the actual contingencies are not allowed for and because the unintended consequences require new policies. We are concerned with dealing with problems and opportunities, actual or predicted, arising out of existing plans, or creating the need for new ones.7/

The essential points that emerge from this discussion are that major differences can be expected in the treatment of monitoring under different sets of operational circumstances and that these are likely to reflect the nature and levels of the operations that are involved. In practice, there is likely to be a range of monitoring and evaluation activities that reflect to a greater or lesser extent both performance review and project implementation models of the kind set out in the management texts and the views of strategic monitoring presented in the urban planning literature.

The Organization of the Paper

This paper reviews the literature on monitoring and evaluation in the light of the perspectives set out above. Special attention is given to the needs of monitoring and evaluation within the urban planning field, with particular reference to metropolitan planning in developing countries. Because of the range of activities that this involves, examples relating to both performance review and strategic monitoring will be considered.

A major difficulty facing the reviewer was the relative absence of detailed critical assessments of monitoring and evaluation experience in urban planning with respect to developing countries. As Taylor and Williams point out, the development of monitoring and evaluation systems for strategic planning purposes is an objective to be strived for rather than an observable component of planning practice.8/ Consequently, it has been necessary to draw upon the experience of a number of more developed countries where there are already well-established systems for monitoring and evaluation purposes in the strategic planning field. British and Dutch experience is of particular importance in this respect because of the extent to which monitoring and evaluation activities have been incorporated into the statutory planning systems of these highly urbanized countries.

Although there is a lack of detailed information on monitoring and evaluation experience in urban planning in developing countries, there is a lot of material dealing with applications to other fields in these areas. This material is a useful source of information with respect to the practical problems that are likely to be experienced in developing monitoring and evaluation systems for urban planning in developing countries.

Given these considerations, a highly selective approach was adopted towards the literature review and a limited number of basic sources that can be regarded as examples of "best practice" have been selected for detailed treatment. Table 6.1 shows that these sources can be divided into three broad categories with respect to their treatment of performance review and strategic monitoring issues. The first of these categories concerns handbooks and sourcebooks that set out general guidelines for the establishment of monitoring and evaluation activities. The second category contains reports resulting from the comparative evaluation of experience in the monitoring and evaluation field. These differ from the first category largely in their emphasis on operational matters and the extent to which they discuss the application of general guidelines to particular sets of circumstances. The third and last category consists of case study material. This is drawn upon largely to provide in-depth illustrations of particular aspects of the monitoring and evaluation process.

Three main aspects of monitoring and evaluation will be considered in the discussion that follows. Firstly, some managerial aspects relating to the policy framework within which monitoring and evaluation operate will be considered to identify what decision makers require from these activities. Secondly, a number of technical issues relating to the different activities that are involved in the process of monitoring and evaluation will be examined. Finally, the institutional structures and staffing policies needed to develop effective monitoring and evaluation systems will be discussed. Because of the relative emphasis that must be placed on technical aspects and the variety of tasks that must be carried out within the monitoring process, these activities have been subdivided into four sequential tasks for purposes of presentation. These relate to the task of problem definition whereby goals and objectives are translated into operational terms, data collection involving a wide range of procedures for gathering different kinds of information, information management concerned with the processing and routine analysis of this material and, finally, the arrangements that are made for reporting the findings of monitoring and evaluation activities to decision makers and other interested parties, respectively.

MANAGERIAL REQUIREMENTS

General Principles

The scope and purpose of monitoring and evaluation activities depends on the requirements of the policy and decision making framework within which they operate. The basic premise underlying the development of operational systems is that they

TABLE 6.1. A CLASSIFICATION OF THE "BEST PRACTICE" SOURCES

Primarily concerned with:

Performance Review	Strategic Monitoring
1. Manuals/sourcebooks	
U.N. (1978) Systematic Monitoring and Evaluation of Integrated Development Programmes	Institute of Local Government Studies (1975) An Exploratory View of Strategic Monitoring
	Scottish Development Dept. (1979) Report of Working Party on Structure Plan Monitoring
2. Review of current practice	
Waller et al. (1976) Monitoring for U.S. Government Agencies	Institute for Operational Research (1977) Monitoring for Development Planning
U.N. Asian and Pacific Development Inst. (1978) Monitoring and Evaluation of Social Development Programmes	Van Meyel (1979) Approaches to Strategic Monitoring; Case Study Approach
World Bank (1980) Managing Information for Rural Development: Lessons from Eastern Africa	Masser and Wilson (1983) Approaches to Information Management in County Planning Authorities in England and Wales
World Bank (1980) Monitoring Rural Development in East Asia	
3. Case Studies	
e.g. Malaysia (Davies, 1981) India (Bhatnagar, 1982) Sri Lanka (I.L.O., 1982)	Britain (Francis, 1981) Netherlands (Scheurwater and Masser, 1983) U.S.A. (Branch, 1981)

should be "designed in such a way that the information obtained facilitates and supports rational decision making on the programme."9/ Because monitoring and evaluation systems are strictly decision oriented in character, their effectiveness must be judged in terms of the contribution they make to improved decision making and implementation.

The degree to which these general principles can be translated into operational terms depends heavily on the nature of the tasks involved and the circumstances surrounding particular planning activities. Because of this, the first stage in the development of any monitoring and evaluation systems is to examine the nature of user requirements by consulting the staff who are likely to be involved. Even within a single organization, it must be recognized that the staff involved may have very different information needs which reflect both differences in the levels of involvement and the nature of the tasks being carried out. For example, policymakers within an organization are likely to be more interested in strategic issues arising out of the contributions made by different policies and programmes towards general goals. Conversely, programme planners are likely to be much more interested in improving the technical soundness of their work. Although the systems developed should try to meet as many of these diverse requirements as possible, the effectiveness of monitoring and evaluation in practice rests to a large extent on its selectiveness and its routine character. For this reason, it is important to avoid the danger of developing systems that attempt to be "all things to all men."

Given these considerations, then, the first task in developing a monitoring system is to identify the potential users and ascertain their information requirements. If their range of requirements is so diverse that it is likely to make the system overcomplex, the next stage will be to impose a specific hierarchy of users in order of priority. A good example of this practice can be found in the World Bank report on the Regional Workshop on Monitoring and Evaluation of Rural Development Projects in Eastern Africa. In this case, there was a strong consensus among participants for "identifying a hierarchy of users, ranking project level needs highest in priority, national- (or regional-) level users intermediately, and donor agencies lowest."10/

Because of the importance of managerial requirements, it is desirable to obtain a high measure of user involvement in the design of monitoring and evaluation systems. Where the range of requirements is diverse, it may be necessary to establish a working party of users to establish a set of common needs and priorities for information. There is also a good argument for involving users in the system design at an early stage to secure their support for monitoring and evaluation activities.11/ Such a commitment not only reduces the possibility of later criticism of these activities but is essential if the system is to operate effectively because much of the information that is required will have to be supplied by the users themselves.

Whatever their detailed requirements, planners and decision makers want information systems to produce information that is accurate, objective, reliable, relevant, timely, and action oriented.12/ The most important of these qualities are relevance and timeliness as monitoring and evaluation is concerned with the provision of information at a time when it can be acted upon to alter programmes and policies. There is little value, from the point of view of the decision maker, in information that shows that something is wrong when it is too late to do anything about it. Most of the other qualities listed relate to the reliability of the system and the confidence that can be placed in the information provided to users. A reason that is often cited for failure to take the appropriate action in time is that users either did not agree with the findings that were obtained from monitoring and evaluation or that they felt they were not conclusive enough to justify special action.

Some Practical Considerations

The implications of these managerial requirements are of considerable significance from the point of view of those involved in the development of monitoring and evaluation systems. In practice, it is likely that a number of major obstacles may have to be resolved in order to meet these requirements. In the case of the criteria of relevance, for example, management may have no clear conceptions as to what information is relevant to its tasks. As a result of their review of monitoring practices in U.S. government agencies, for example, Waller and his colleagues concluded that the basic problem is "to design and supply information to a management structure which may not know what information it wants or how it would act if it received particular types of information.13/ Such experience suggests that it is often desirable for those involved to build in a measure of self-evaluation into their own operation. This involves them not only in the supply of information but in monitoring the use that is made of this information in practice.

Problems are likely to arise particularly in cases where management requirements are likely to change and/or where a long lead time is needed before the system becomes operational. Circumstances of this kind led Scheurwater and Masser to adopt a step-by-step approach to the design and implementation of an information analysis system for monitoring strategic planning in the Netherlands.14/ This involved a preliminary investigation, as a result of which a rudimentary system was constructed that fulfilled the most urgent needs for information. The decision to develop a "quick and dirty" prototype arose out of the problems encountered in finding motivated future users within the organization who could adequately specify in advance what they required from the system. In this case, the problems were exacerbated by the organization's limited experience with monitoring activities and the potentially broad and complex range of subject matter involved. On the basis of the experience gained using the prototype, users developed a better understanding of the monitoring and evaluation system. At the same time efforts were made to stimulate user feedback to enable the researchers to examine their own priorities with respect to additional data requirements, the need for special methods and techniques, and questions related to the presentation of material.

Another important factor that needs to be considered in the design and implementation of monitoring and evaluation systems is the constraints that are placed upon the potential users by the nature of their day-to-day tasks. It should be borne in mind that the opportunities for many users to systematically evaluate the findings of monitoring and evaluation activities are often very limited. Some indication of the constraints placed upon users in this respect is given by the findings of Wilson's analysis of information needs of English local government staff in different types of department.15/ The findings of this study indicate that nearly three quarters of respondents felt that they were unable to devote more than a relatively short time span of attention to a particular task. Their characteristic mode of operation involved a very large number of encounters of less than five minutes in which information was exchanged. Furthermore, at least a quarter and in some cases more than half the total working time of senior management staff was taken up by meetings. In contrast, specialist and project staff found that they spent much less time in meetings but often had to spend a considerable proportion of their working time in traveling, particularly where the activities of the organization were dispersed over a large geographical area.

Factors such as these led the participants in the Workshop on the Monitoring and Evaluation of Rural Development Projects in Eastern Asia16/ to be highly critical of the efforts of project managers. On the basis of the experience reported in a number of case studies of practice, they concluded that very few project managers were highly committed to monitoring and some had a poor relationship with the monitoring staff. They also felt that the use that was made of information was not effective because project managers often lacked the necessary qualifications, authority, and power to reallocate resources during project implementation. For this reason, they concluded that "information resulting from monitoring or rural development projects in East Asia has seldom been used effectively."

Summary and Conclusions

Two main points emerge from the discussion of managerial requirements:

1. Monitoring and evaluation systems must be strictly decision oriented and highly disciplined in terms of their organization. These criteria are essential if monitoring systems are to satisfy the requirements of relevance and timeliness. In other words, the effectiveness of monitoring and evaluation systems is likely to be judged in relation to the degree to which they are capable of supplying the right information at the right time.

2. The capabilities of users to process and analyse the information supplied by monitoring systems should not be overestimated. For this reason, it will be necessary to take account of the nature and type of pressures on the users' time that will constrain their efforts.

PROBLEM DEFINITION

General Principles

The first stage of the technical monitoring and evaluation process is to identify its operational requirements. This involves a careful analysis and description of the policies and programmes involved in which particular attention must be given to define the objectives that are being sought and ways in which these have been translated into policies and programmes. It will also be necessary to consider the proposed phasing of operations and the types of instrument that are to be employed for implementation purposes.

Three main tasks are involved in defining the programme framework for the monitoring of integrated development programmes.17/ The first of these tasks involves the definition of programme objectives into measurable terms. It is envisaged that both quantitative and qualitative indicators will be required to evaluate different aspects of performance. In either case, these objectives must be defined precisely so that repeated comparisons can be made between expectations and achievements. This requires that "clear and unambiguous formulations are made which do not allow any uncertainties to exist about the programme purpose."18/

Once these objectives have been specified, it is possible to move onto the second task in the problem definition process. This involves describing the assumptions that underlie the proposed policies and programmes. In this respect, special attention must be given to the ways in which project inputs/activities are to be converted into results. It will also be necessary to examine the linkages between various project components and to consider the extent to which the objectives of each component relate to one another and to the overall exercise, and the degree to which external factors are likely to affect the successful completion of the programme will have to be assessed.

Given that the objectives of the programme can be defined in measurable terms and the assumptions underlying them described, it is then possible to move onto the third stage of programme definition which involves the selection of performance indicators. The basic advantage of selecting performance indicators for comparative purposes is they restrict the needs for data collection and the demands that these place on subsequent stages of the technical monitoring and evaluation process.19/ The degree to which this can be attained depends very much on the extent to which the programme objectives and hypotheses can be defined in precise terms. As the manual prepared by Waller and his colleagues for monitoring in U.S. government agencies points out,

> for the type of monitoring system recommended in this manual, the monitoring system manager needs to structure the analysis around the comparison of objective descriptions of numerical data on pre-specified events.20/

Although similar views are frequently expressed with respect to strategic monitoring, the broader scope of the activities involved makes it necessary to restate the third stage of the problem definition tasks.21/

In this case, it may be necessary to distinguish between three different types of policy statement in connexion with strategic monitoring:22/

1. Monitoring of key issues that have been identified in the course of plan preparation and the identification of new key issues. At an early stage in the design

process it is essential that the critical issues facing the area are identified for monitoring purposes. Generally, these are regarded as falling within the following policy areas: land use allocation, industry and employment, housing and population, and transport.

2. Monitoring of the policies and proposals for other agencies. An essential requirement of strategic monitoring systems is to establish networks for recording information about the decisions and commitments made by other agencies that impinge upon the policies and programmes that are being monitored.

3. Monitoring of the uncertainties underlying the areas of choice facing the programme agency and the assumptions that have been made to arrive at current policy commitments. In comparison with the other two types of policy statement, this area of monitoring is relatively unbounded in scope. Consequently, it imposes a special kind of demand on those involved in the monitoring and evaluation process.

The Specification of Performance Indicators

Wherever possible, policies should be formulated in such a way that facilitates the specification of performance indicators. In practice, however, a great deal of work is often involved in translating general objectives into statements that can be measured by performance indicators. Nevertheless, many of these problems can be reduced by a careful wording of policy statements. Some useful advice on these matters is given by the Scottish Development Department's Working Party on Structure Plan Monitoring.23/ This distinguishes between three different kinds of policies and proposals:

1. Policies and proposals that include quantification. These are most often proposals that set limits on particular land use activities as in the following example from the West Glamorgan Structure Plan:

> It is the County Council's policy to allow the development of up to 900 dwellings in the Neath and Dullar Valleys by 1991 by releasing land in the settlements of Crynant, Seven Sisters, Resolven and Glynneath.

2. Policies and proposals that do not include quantification. In many cases these refer to once and for all operations that are dependent on recording whether

specific land use proposals have or have not taken place as in the following example from the same Structure Plan:

> It is the County Council's policy that a new road shall be constructed between Port Talbot tidal harbour and the M4 interchange at Margam in order to....

3. Policies and proposals intended to guide development control. These fall into two subcategories relating to cases where potential breaches in policy are immediately apparent and situations where it is necessary to decide whether individual cases are consistent with the overall spirit of policy, respectively.

Several English county planning authorities have given a great deal of thought to the specification of performance indicators. The experience of Hertfordshire is particularly useful in this respect for the amount of detail that is given regarding the procedures to be followed.24/ Three different types of operational guidelines are defined for monitoring purposes with respect to the assumptions underlying policies, the policies themselves, and particular area policies, respectively.

1. Assumptions underlying policies. Existing forecasts of population growth, household formation, housing needs, and labour supply and demand need to be revised as new information becomes available. In the case of population, for example, the population forecasts were prepared using a cohort survival model on the basis of stated assumptions regarding fertility rates, death rates, migration levels, etc. Two different assumptions were made regarding future fertility rates, both of which showed a continuing decline to 1976 and a recovery thereafter to 1991. Only one assumption was made regarding future death rates, mainly because it was felt that death rates did not fluctuate as much as fertility rates. In the case of migration, two different levels of net immigration were assumed of 1,800 persons per annum and 1,000 persons per annum on the basis of annual forecasts for the greater London outer metropolitan area obtained from the Office of Population Censuses and Surveys.

2. Specific structure plan policies. Forty different policy fields were identified by the county for monitoring purposes. Some of these had to be subdi-

vided in order to develop performance indicators. Consequently, a total of forty-eight different sets of performance indicators were used in monitoring. For each of these indicators, the county set out its implicit monitoring objective, a precise statement of policy, a note on subsidiary guidelines to be followed in monitoring and evaluation, and an indication of performance measures and criteria. Appendix A contains a typical example of one of the policy fields defined by Hertfordshire. This relates to the general employment policy for the county as a whole. From this it can be seen that the basic objective of monitoring, as might be expected in an area of restraint, is to contain the growth of employment opportunities subject to certain conditions. In the interpretation of these conditions it will also be necessary to take account of the special local policies which apply to different parts of the county. The essential information that is required for monitoring purposes concerns the characteristics of firms intending to locate in the county, and a number of indices of the likely impact of the proposed development on existing levels of labour supply and demand.

3. Area statements. The county is divided into seven different geographical areas for structure planning purposes. Within each of these areas, a number of special local factors need to be taken account of that may modify the implementation of countywide policies. To assist in monitoring the performance in each of these areas, the county has developed a system of control totals, relating to expected rates of population increase, construction, and employment growth. These control totals are regarded "not as expressions of policy themselves, as though they were target levels, but rather are numerical assessments of the effect of the policies and indications of the relationships between the key issues in the policy area concerned." Table 6.2 contains an example of the application of the control totals system to West Hertfordshire. From this it can be seen that the population of this area is expected to increase by between 12,400 and 15,600 between 1971 and 1991. During this period it is anticipated that there will be an increase of 10,900 in the number of dwellings that are available in the area. By comparison with past growth rates, the expected increases involve a substantial reduction in growth within West Hertfordshire. This is particularly evident in the case of the growth of the labour supply where an average annual growth rate of only 0.7 per cent is anticipated during the plan period.

TABLE 6.2. AN EXAMPLE OF CONTROL TOTALS USED FOR MONITORING PURPOSES WITHIN DIFFERENT AREAS OF A REGION

CONTROL LEVELS FOR WEST HERTFORDSHIRE POPULATION AND HOUSING

5-year period	Population Increase		Housing Increase
	Birth Rate		Dwellings
	Low	High	
1971-76	4,100		3,200
1976-81	2,300	3,800	2,600
1981-86	3,000	3,900	2,800
1986-91	3,000	3,800	2,300
Total 1971-91	12,400	15,600	10,900

PAST GROWTH RATES

5-year period	Population Increase	Dwellings Built
1961-66	13,100	5,300
1966-71	9,100	4,300

EMPLOYMENT (LABOUR SUPPLY)

1971	1976	1981	1986	1991
48,500	51,300	53,800	55,400	55,300

PAST LEVELS

1961	1966
38,700	44,500

AVERAGE ANNUAL GROWTH RATES %

1961-66	2.8
1966-71	1.8
1971-91	0.7

Source: Herts County Planning Dept., "Performance Indicators" in Monitoring Process Report (Herts, 1976), p. 56.

Evaluation

The usefulness of performance indicators of the kind described above for strategic monitoring purposes has been questioned by many authorities. For example, one review of English structure planning practice concludes that performance indicators based on thinking about management control systems are "becoming less and less relevant to fields of local authority operation in which the control of events is often indirect and uncertain, and in which objectives may change rapidly in response to shifting pressures within local communities."25/ Similar doubts about the usefulness of performance indicators are also expressed in the Institute of Local Government Studies report.26/ This draws attention to the difficulties of expressing policies in operational terms that would enable them to be monitored. As a result, there is a lack of precision which means that the determination of deviations from policy is often unsuccessful. In one case, for example, "significant deviations from the strategy were rarely detected by the monitoring unit before they were pointed out by one of the local authorities in the subregion."

In addition to criticizing the use of performance indicators on the grounds that they lack precision, the INLOGOV report draws attention to their narrowness of outlook. It points out that it is often the indirect rather than the direct consequences of policy that require urgent action even though these are not measured by the performance indicators. There are also likely to be major problems in devising indicators to monitor planning assumptions in the light of changing circumstances, because of the extent to which monitoring is concerned with the identification of new and unexpected problems that lie outside the present scope of planning activities.

To overcome these limitations, the authors put forward a mixed scanning model which combines elements of performance review and strategic monitoring within a single framework. The essential features of this model can be described in the following terms:

> Mixed scanning involves collecting specific information with high resolution of detail about issues that we know to be of regional importance and analysing them in depth. This will include reviewing the performance of current policies. At the same time this approach involves taking a very wide, low resolution scan, of all matters that could potentially affect the region, and 'zooming in' on those matters which in the judgement of those involved are of regional importance.27/

There is very little indication in the literature of the relative weight that is attached to the two components of the mixed scanning model by English planning authorities. However, the findings of a recent survey conducted by Masser and Wilson show that there was a majority of county planning authorities in favour of the view that the main function of monitoring is to identify new problems and choices for the authority as against a large minority who felt that its function was to carry out routine reviews of progress towards policy implementation.28/ The findings of the survey also suggest that the routine view of monitoring functions was more likely to be the case in authorities that gave top priority to land use planning questions, whereas authorities giving a higher priority to economic development and social issues were more likely to see monitoring in broader terms.

There is some evidence to suggest that the limitations of performance indicators are also recognized by those directly concerned with performance review activities. For example, the report of the Consultative Meeting on the Monitoring and Evaluation of Social Development Programmes in Manila contains the following comment on performance indicators.

> Categories of measures identified for purposes of programme monitoring and evaluation necessarily encompass policy level, administrative, and technical concerns. Their sufficiency is determined not only by the extent to which they reflect the content of stated programme goals and objectives, and allied evaluative criteria, but by the way in which they accommodate other anticipated (and at times negative) programme results.29/

In practice, a major problem facing monitoring and evaluation lies in the extent to which the objectives of policy are defined in either vague or ambiguous terms. This is particularly the case in many rural development projects in which objectives are often not only poorly defined but contradictory and conflicting in character.30/ Experiences of this kind emphasize the importance of closely questionning those involved with plan and policy formulation prior to the development and specification of performance indicators.

Summary and Conclusions

Four main points arising out of the discussion of problem definition can be summarized as follows.

1. There is a need for the objectives of monitoring to be defined clearly and unambiguously. If this is not

at first the case, it is worth spending a considerable amount of effort at this stage in the monitoring process on a careful analysis of the programmes and policies involved to clarify the tasks required.

2. In addition to defining the programme objectives, it is also necessary to identify the main assumptions that underlie them so that they can also be incorporated in the monitoring process.

3. Wherever possible, performance indicators should be specified that enable comparisons to be made between observed and expected values. These involve not only quantitative indices but also the occurrence or nonoccurrence of once and for all events such as the completion of a road project.

4. It must be recognized that there are a number of important limitations associated with performance indicators in monitoring and evaluation, particularly in relation to strategic monitoring activities. For this reason, a mixed scanning model which combines elements of performance review and strategic monitoring is proposed, which overcomes some of these limitations.

DATA COLLECTION

General Principles

The scope and character of data collection that is associated with monitoring and evaluation activities reflects the ways in which the tasks themselves have been formulated at the outset of the exercise and the resources that are available for this purpose. There is a clear distinction between project management and performance review activities which make a relatively limited demand on data collection facilities on the one hand, and those of strategic monitoring which make much more extensive demands on the other.

Appendix B gives a general indication of the range of data collection that is involved at the strategic monitoring level. It illustrates the information requirements associated with four different types of strategic monitoring activity. The first of these concerns the review of progress towards plan implementation. In this case the data needs are likely to be met largely from the operational data that is collected by the agency in the course of its own activities. A broader range of sources is utilized in the second of these which relates to the overall effectiveness of planning policies. As Appendix B shows, much of the information that is required for monitoring purposes in this case must be obtained from other planning agencies at either higher or lower levels in the administrative hierarchy. An even broader range of sources must be scanned in connexion with the third area which involves monitoring uncertainties surrounding the plans. In this case, it is necessary to obtain intelligence rather than facts and figures which indicate the directions of political change and the emergence of new issues of public concern. Finally, there is also a need for hard factual information from various sources to test the assumptions that are being made regarding the growth of population, construction activities, and employment.

Most of this information must be collected from secondary sources and a great deal of effort on the part of those concerned with monitoring and evaluation may be needed in order to assemble and collate this information. Because of this, data collection must be regarded as anything but a purely passive exercise from the standpoint of monitoring and evaluation. The situation that typically faces most urban planning agencies has been described by Francis in the following terms.

> To reduce uncertainty, the information base for strategic monitoring must be far more than a passive exercise in the collection and neat arrangement of numbers easily available on those current trends which are vaguely thought to be relevant. It includes selection, analysis and a systematic search for verbal information. Changes in projections and members' views are as much a part of the information base for strategic monitoring as are current trends in the birth rate.31/

With these considerations in mind, it is useful to distinguish between statistical data collection and intelligence gathering activities. This distinction broadly reflects the difference between quantitative and qualitative data, although it must be recognized that the latter includes hard events (e.g., policies approved, commitments made, events that have occurred) as well as soft information (e.g., emerging policies and changing attitudes).32/

There is also likely to be a need for basic survey research to be used for data collection purposes, particularly at the performance review and project management levels. In the opinion of the authors of the United Nations sourcebook, "secondary data sources will not cover all the required variables, the proper target group, or the appropriate time frame. The verification of some programme aspects will always require special data collection efforts."33/ For this reason, it is also necessary to consider what forms of survey research techniques are most appropriate for monitoring and evaluation purposes.

Statistical Data

Table 6.3 contains a typical list of the statistical data sources used for strategic monitoring purposes in an English county planning authority. From this it can be seen that the main sources can be grouped into three broad categories. The first category consists of operational data that is collected by the authority itself in the course of its duties. The Land Development Progress System that has been developed by the county for the analysis of planning decisions and land availability is probably the most important single source of information for monitoring purposes. The second category consists of information obtained largely from central government sources such as the Population Census and the Census of Employment. The third category consists of the forecasts and projections used by the authority for planning purposes. As new information becomes available it will need to be updated for monitoring and evaluation purposes.

Table 6.3 gives a very good indication of the diversity of different sources that provide the statistical data used in monitoring and evaluation. It indicates that there are major differences between these sources in terms of their areal coverage and the frequency with which they are updated. It is also necessary to take account of definitional differences in relation to the specification of the variables used in each case. For this reason, questions of consistency and comparability are likely to occupy a great deal of the effort that is devoted to data collection activities.

To make the most effective use of the resources that are available, it will be necessary to cross departmental and sectional boundaries not only within the planning agency but also between agencies. This may present formidable problems in practice unless those concerned with monitoring and evaluation are able to demonstrate that the supply of information leads to the mutual benefit of both parties concerned. A good example of this type of cooperation can be found in English structure planning practice where some county planning authorities have come to an agreement with the district councils who handle the bulk of the planning applications, whereby they supply a sophisticated computer-based information management facility in return for detailed information on planning applications and building permits.

Given the selective character of monitoring and evaluation, it is important to recognize that the extent to which authorities are data-rich or data-poor depends as much on the relevance of the information that is collected as is its quantity. Even in data-rich countries such as Britain, lack of relevant information was regarded as the most serious operational problem area from the point of view of the monitoring activities carried out by the county planning authorities surveyed by Masser and Wilson.34/ These views are echoed in the INLOGOV report, as follows:

> One of the most difficult problems to handle satisfactorily is the selection of information, for the problem in general is not one of obtaining enough information, rather it is one of reducing the amount of irrelevant material so that the relevant information can be perceived and acted upon, while still maintaining the capacity to perceive the relevance of new information.35/

Intelligence

Appendix B gives a good indication of the diversity of forms of intelligence that are utilized by a planning agency in the course of its normal duties. This material comes from published and unpublished reports, committee papers, the press, personal contacts, and consultations with other agencies. An important task for those concerned with monitoring and evaluation will be to establish formal and informal networks for intelligence gathering purposes. In the case of the former, this may involve regular meetings with interested parties or the establishment of joint working parties. A good example of this can be found in the English county planning authorities that have established systems whereby the Chief Officers of the districts meet with the County Planning Officer regularly to discuss matters of common interest. Such arrangements not only facilitate contacts at the senior levels of management but also promote contacts on specific topics at other levels. As in the case of statistical data, the successful operation of these networks depends to a very large extent on reciprocity. In other words those involved with monitoring and evaluation have to be able to provide items of intelligence which other members of the network will find relevant to their own needs.36/

There are a number of important practical problems that need to be taken account of in the organization of intelligence gathering activities. Although formal contacts between the agency and other agencies must be maintained at the senior management level, it is desirable wherever possible to broaden the range of participation in intelligence gathering in order to reduce the pressures on senior management. With these considerations in mind, several English counties have assigned responsibilities for particular aspects of monitoring and evaluation to relatively junior staff with a view to their becoming the main point of contact with outside organizations in that field. Nevertheless, it must be recognized that such a strategy may be seriously inhibited by the working procedures of the organization, particularly where it places heavy constraints on the discretion of lower and middle level management.

Similar formal and informal networks need to be established for intelligence gathering purposes in relation to community, industrial, and commercial groups, as well as other agencies that are directly concerned with planning activities. In this case there will have to be an even stronger emphasis on the mutual benefits to be obtained by these means, given the heavy pressures that are likely to be placed on the time and resources available for those participating in such activities.

Survey Research

The nature of monitoring and evaluation precludes large-scale survey research on resource grounds and also because of the time lag which is likely to be involved before the findings of such research become available. For this reason, survey research activities are likely to be generally restricted to small-scale exercises designed to provide essential information on particular issues of concern where information is currently lacking. Situations of this kind are most likely to arise in connexion with performance review but, as Table 6.3 shows, in-house studies may also be needed at the strategic monitoring level to fill in gaps.

Given these considerations, there is general agreement that data collection procedures involving large-scale surveys should be avoided wherever possible. For example, the participants of the Workshop on Monitoring Rural Development in East Asia came to the following conclusion:

> Methods other than large-scale surveys to collect data need to be explored. The combination of several data collection techniques could often be advantageous. Formal and informal approaches, systematic and *ad hoc* studies, intensive interviews, surveys and case studies are often compatible and can be used simultaneously.37/

A similar standpoint is expressed in the United Nations sourcebook, where it is argued that it is necessary to develop a survey framework that enables comparisons to be made across both space (i.e., between different project areas) and time (i.e., regular measures that can be compared with benchmark data to measure how much progress has been achieved).38/ For these purposes the case study method is an appropriate method, given that the cases are selected on a strictly random basis. Because of the constraints imposed by monitoring requirements,

TABLE 6.3. QUANTITATIVE DATA RELEVANT TO STRATEGIC MONITORING IN AN ENGLISH COUNTY

	Minimum Areal Unit	Frequency of Update	Source	Use in Strategic Monitoring
INTERNAL BASIC DATA SYSTEMS				
Land Development Progress System (LDPS)	site; grid ref.	continuous	District planning authorities	analysis of planning decisions, development progress, and land availability
Enhanced Electoral Registration (EER)	ward	biennial	Joint county-district survey	size and structure of current population and households
Mineral Sites	site; grid ref.	annual	survey	production and restoration of mineral sites, and hence, effectiveness of mineral and landscape policies
Archaeological Sites	site; grid ref.	continuous	survey	preservation of archaeological heritage
One-off Surveys (e.g., employers; household; rural transport; house condition)	various	-	survey	establishing relationships, supplementing existing data and "filling holes"
Rural Settlements	settlement	as necessary	EER; LDPS; 1971 Census; Survey	service provision in rural areas and trends in population, and hence, effectiveness of rural policies
EXTERNAL BASIC DATA SYSTEMS				
Census of population	ED	10 years	Central Government	1971 base and relationships; long-term trends
Census of Employment (ACE)	address; zone; local office area	annual (but 4 years out of date)	Central Government	size and structure of employment
Unemployment and vacancies	local office area	monthly	Central Government	trends in number and structure of unemployed and vacancies
Agricultural Census	parish	annual (but 3 years out of date)	Central Government	trends in rural land use; employment in agriculture; viability of agriculture
Forecasts and Projections				
Small area population forecasts	ED	annual	LDPS; EER; surveys; other	population implication of residential commitments for next seven years, and hence, likely future demand for services and infrastructure
Long-term employment projections	SPA (and subareas controlled to SPA)	as necessary	ACE; 1971 census; survey; other	projection of future employment demand; future land needs
Long-term population, household, and dwelling need projections	SPA (and districts and subareas controlled to SPA)	as necessary	EER; surveys; 1971 Census; employment projections; other	projections of future size and structure of the population to 2001, and hence, demand for services, infrastructure, land take

Source: K. Francis, "The Monitoring of Structure Plan in the 1980s" in H. Voogd, ed., Strategic Planning in a Dynamic Society (Delft: Delftsche U.M., 1981).

Notes: ED Enumeration district; SPA structure plan area these case studies should not be in-depth studies but utilize data obtained from a variety of sources. These might include "a random sample of individuals or households, interviews with community leaders and systematic observation of social, political, and economic activities."

Summary and Conclusions

Five main points emerge from the discussion of data collection activities:

1. The scope of data collection activities depends on the extent to which the goals and objectives of the exercise can be expressed in operational terms. It is likely to be much broader for this reason in the case of strategic monitoring than in respect of performance review and project management.

2. Effective monitoring and evaluation at the strategic level depends heavily on the extent to which secondary sources can be utilized. Operational data that is collected by the agency itself is likely to be of critical importance at both this level and the performance review level. At the strategic level, survey research techniques are likely to be employed only in exceptional circumstances.

3. Questions of consistency and comparability are likely to occupy a great deal of the effort that is devoted to the collection of statistical data, because of the diversity of sources from which this material is obtained. The extent to which these difficulties can be overcome will depend on the degree of intra- and interagency cooperation.

4. Consultations with other parts of the same agency, other agencies, interest groups, and the public as a whole play a central role in intelligence gathering. The character of both the informal and the formal networks that exist between these groups is likely to exert a profound influence on the quality of the intelligence gathered by these means. Wherever possible, networks should be developed that minimize the strain that is put upon senior management staff.

5. Large-scale questionnaire surveys should be avoided as a means of data collection for monitoring and evaluation. Where direct survey research is required, an appropriate method would be to use case study techniques which employ a variety of data gathering procedures.

INFORMATION MANAGEMENT

General Principles

The information management systems that are developed for monitoring and evaluation must satisfy two criteria. In the first place, they should be designed in such a way that incoming information is processed as quickly as possible to give users the maximum amount of time in which to take corrective action. Secondly, this information must be stored in the system so that it can be easily retrieved subsequently by users. In the first case, the most important design criteria concern the need for data set reduction to transform raw data into the information that is required for monitoring and evaluation. With this in mind, a wide range of summary variables, performance indicators, and comparative measures must be devised for routine data processing purposes to signal deviations from expected values that may require more detailed investigation. In the second case, the most important design criteria are the need to store information in such a way that it can be easily accessed by users in a form that is flexible enough to be manipulated by them to meet their requirements. For this purpose, it is necessary in most cases to develop specialized forms of data base management system.

The relative weight that is attached to these criteria in practice depends upon the circumstances in which monitoring and evaluation is being undertaken. Data set reduction is generally the dominant factor in performance review and project management, while information retrieval is likely to be more important in the case of strategic monitoring. However, such information as is available from practice suggests that, even in strategic monitoring, a greater weight is generally given to data set reduction questions than information retrieval issues. This is reflected in the findings of the survey of information management in English county planning authorities that was carried out by Masser and Wilson.39/ The same survey indicates that there is a general agreement among these authorities that some kind of computer based system is essential for all but the most simple monitoring and evaluation activities. A majority of thirty-eight out of the forty-four responding authorities made use of computer based systems for information management purposes. Because of the special requirements imposed by monitoring and evaluation activities, a very strong preference was expressed for management systems that were specially designed for these purposes rather than agency-wide management information systems (forty out of forty-four responding authorities). Subsequent follow-up investigations have revealed that there are considerable differences in the level of sophistication that is involved in these information management systems and also in the form in which they are implemented.40/

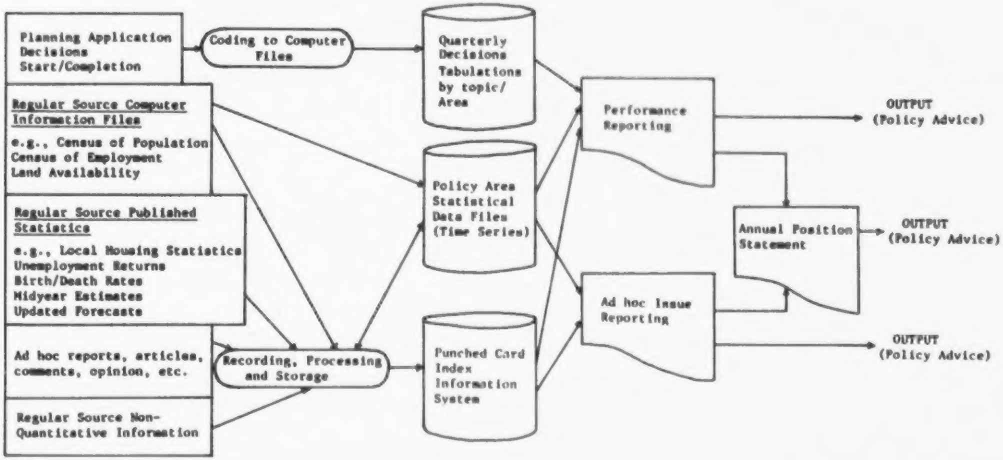
In general, there is a preference among English county planning authorities for the development of mainframe computer based systems because of the size of the data sets involved. There is a feeling that microprocessors should be utilized only in cases where networks exist that make it possible for them to access the data sets held in a mainframe system. However, despite these views, there is an increasing tendency in Britain for stand-alone micros to be utilized particularly for small-scale management control problems and also for particular aspects of information management such as qualitative data handling.

A good example of the main elements that are involved in information management can be seen from figure 17. This lists the different kinds of data sources involved and the processing that takes place in relation to each of them. It also outlines the reporting procedures associated with these information management tasks. With the exception of the planning applications information, the statistical data that is obtained from both internal and external sources is stored in its original form on the mainframe system so that it can be accessed when required. From this data, a number of policy area statistical data files are created which summarize this information for monitoring purposes. Although they are treated separately because of the amount of detail that is involved, the planning applications information is treated in a similar manner with sets of tabulations being prepared for each topic and/or area on a quarterly basis for monitoring purposes. The same basic philosophy is also applied to qualitative data, although this is not held in the mainframe computer system. In this case, a simple manual system based on edge-punched cards and coded key words is used for information retrieval purposes.

The Management of Statistical Data

Two case studies illustrate the main issues that are involved in the management of statistical data for performance review and strategic monitoring purposes, respectively. The first of these concerns the development of a management information system for a health delivery system in rural India.41/ In this case, four different levels of management were involved ranging from the field worker who operates from a subcentre, through the primary health centre and the district health office to the state directorate itself. From figure 18, it can be seen that there are considerable differences between the requirements of each of these management levels. While the field units in the primary health centres are largely concerned with monitoring the performance of individual workers, the secretariat is essentially involved with budgetary control and medium-term planning.

Figure 17. Components of a typical information management system developed for strategic monitoring


Planning Application
Decisions
Start/Completion
Coding to Computer Files
Quarterly Decisions Tabulations by topic/ Area
Regular Source Computer Information Files
e.g., Census of Population
Census of Employment
Land Availability
Regular Source Published Statistics
e.g., Local Housing Statistics
Unemployment Returns
Birth/Death Rates
Midyear Estimates
Updated Forecasts
Ad hoc reports, articles, comments, opinion, etc.
Regular Source Non-Quantitative Information
Recording, Processing and Storage
Policy Area Statistical Data Files (Time Series)
Punched Card Index Information System
Performance Reporting
Ad hoc Issue Reporting
Annual Position Statement
OUTPUT (Policy Advice)
OUTPUT (Policy Advice)
OUTPUT (Policy Advice)

Source: Herts County Planning Dept., Monitoring Process Report (Herts, 1976).

Figure 18. Design criteria for a typical management information system for performance reviews

Key Tasks Levels	Planning	Monitoring
Secretariat Director	Budgets Health service planning -infrastructure -new schemes	Expenditure against budget performance of districts
Programme Officers	Programme planning Planning of supplies & personnel	Performance of programme and schemes
Field Units	Activities, supplies	performance of workers

Review of existing system

*Record keeping voluminous

*Establishment and budget data separate from programme data

*Separate reports for programme

*No formal feedback to districts, PHCs, workers

*Inadequate formal analysis for planning

Areas needing strengthening

*Rationalize record keeping

*Formal feedback to PHC districts on performance

*Relating input activities to output

*Relate performance of different programmes

*Planning for programme

*Health planning

Major design features

a) Redesign PHC records, cards
b) Monthly feedback reports
c) Annual report & feedback
d) District monthly summary
e) Analysis sheets, summary of environmental data.
Data base for health planning

Source: S. C. Bhatnagar, "A Framework for Designing an MIS for Health Delivery System in Rural India," Socio-Economic Planning Sciences 16 (1982): 17

A review of the existing manual systems indicated that the amount of data gathered in the form of records was voluminous. It was also found that there were very poor links between different levels of management. For example, the establishment of budgetary data was kept largely separate from the programme data and there was little feedback to the districts, the primary health centres, or individual workers. The system proposed by Bhatnagar seeks to rationalize the system of records and establish better information flows between the different levels of management. A computer based rather than a manual information management system is preferred for three main reasons: first, the need to facilitate feedback between the different levels of management; second, to enable complex indicators that draw upon several different data sources to be calculated; and third,. to make it possible for the same data to be analysed both in terms of regions and programme elements. For a typical state of 20,000 villages, the amount of data that is involved is quite large. Nevertheless, Bhatnagar concludes that a microprocessor based computer would be adequate for these purposes, although the same tasks could also be carried out on a mainframe system if sufficient computer time was available.

The second case study involves the information analysis system developed for the Dutch National Physical Planning Agency by Scheurwater and Masser as a tool for strategic monitoring at the national level.42/ This system offers a much more extensive range of facilities than those available in the previous case. Special account was taken in the design of the system in which planners carry out their monitoring and evaluation tasks. The findings of an initial analysis of user behaviour indicated the extent to which users worked in a stepwise fashion whereby the results of one phase of analysis determined to a very large extent the directions that were seen to be relevant for subsequent phases of their work. For these reasons, it was felt to be essential that the information management system should be designed in such a way that it could be operated by users themselves in an interactive manner.

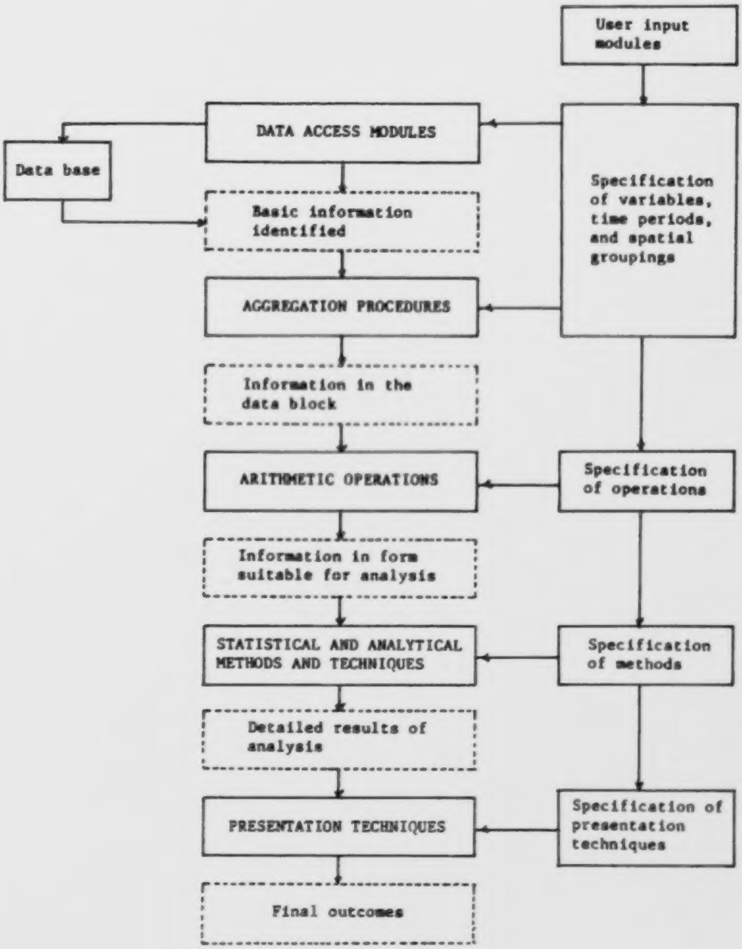
The essential features of the system are summarized in figure 19. This shows that it consists of six main components:

1. User input module that accept input from the user's terminal, check it for internal consistency, data availability, etc.

2. Data access modules that collect the data from the data base.

3. Aggregation procedures that are used to group these data into the class defined by the user and put them into the data block.

Figure 19. Components of an information analysis system developed for strategic monitoring


User input modules
DATA ACCESS MODULES
Data base
Basic information identified
Specification of variables, time periods, and spatial groupings
AGGREGATION PROCEDURES
Information in the data block
ARITHMETIC OPERATIONS
Specification of operations
Information in form suitable for analysis
STATISTICAL AND ANALYTICAL METHODS AND TECHNIQUES
Specification of methods
Detailed results of analysis
PRESENTATION TECHNIQUES
Specification of presentation techniques
Final outcomes

Source: J. Scheurwater and I. Masser, "An Information Analysis System for Spatial Planning in the Netherlands," Social Science Information Studies 3 (1983): 103.

4. Arithmetic modules that perform simple operations on the data block.

5. Statistical and analytical methods and techniques that are required to analyse the data in the data block.

6. Presentation techniques that control the form of the output of the results to the users.

Special command languages have been developed to enable both beginners and expert users in the National Physical Planning Agency to manipulate the data base through computer terminals located in two centres more than 100 km apart. By these means, users are able to build up their own files from the data base for their own configurations of spatial units and variable sets and also carry out basic arithmetic and statistical analysis on these files. In the development of the system, special attention has been given to the design of simple graphical and mapping techniques for analytical purposes. This reflects the demands of the users who see them as an essential part of the process of data set reduction, which enables them to identify issues for more detailed investigation rather than merely as a device for external presentation purposes.

The Management of Qualitative Data

Some of the main features of qualitative information management are illustrated by another example from the Netherlands. KISS is an experimental computer based qualitative information system that has been developed by Scheele.43/ It is concerned essentially with the storage and retrieval of verbal statements or items of up to about seventy words in length. These are accessed through labels or codes that are attached to items which indicate the content of the subject matter, its location, and the nature and date of the source.

Regular output of incoming material on selected variables is available from the system in the form of standard computer printout and also on microfiche. This latter media is preferred because of its compactness and economy in that a single microfiche has the capacity to contain 207 pages of A3 format. In addition to this regular output, users are able to interrogate the system by initiating searches to retrieve information using the system of predetermined labels and codes. A central part of this system is the thesaurus of key words which incorporates the provisional Utrecht planning classification developed by Scheele with the help of a working party of officials from the Provincial Planning Department. This classification combines standard thesaurus sources, specific user requirements identified by the working party, as well as a checklist of legal procedural terms used in planning practice. A prototype of this system has been tested in the context of both performance monitoring of detailed local plans and strategic monitoring of structure planning in the province of Utrecht. As figure 17 indicated, similar procedures have been developed by Hertfordshire for their own purposes using, in the first place, a system of edge-punched cards. More recently, this system has been transferred to a microcomputer.44/ Appendix C contains an example of the standard record that is contained in this system. From this, it can be seen that the record contains a brief abstract of the item of information, together with a number of subject and location codings that can be used for retrieval purposes. The record also notes the date and source of the information item.

Summary and Conclusions

Four main points emerge from the preceding discussion of information management issues in monitoring and evaluation.

1. Information management systems need to be developed which can satisfy both the objectives of data set reduction on the one hand, and provide facilities for the storage and retrieval of large data sets on the other.

2. Questions relating to data set reduction are likely to be the dominant factor in the design of information management systems for performance review and project management purposes. Information storage and retrieval matters are likely to be more important in strategic monitoring. Nevertheless, even in this case, it is likely that greater emphasis will be given to data set reduction matters.

3. For most purposes, information management in monitoring and evaluation requires computer based systems. The special requirements of monitoring and evaluation make it desirable that special purpose data base management systems are developed for these tasks.

4. Because of the large size of the data bases that are used in monitoring and evaluation, mainframe computer systems are preferred. However, there is a general tendency for stand-alone micros to be increasingly used in cases where small to medium data sets are involved and also for specific tasks such as qualitative data handling.

REPORTING PROCEDURES

General Principles

The manner and form in which the findings of monitoring and evaluation are presented to those involved in the planning process needs very careful consideration. Reporting is only the first stage in a three-stage process, whereby the findings of monitoring and evaluation are translated into actions. The second stage of this process involves a detailed reassessment of existing policies and programmes in response to the issues raised by the reports, while the final stage concerns the formal decision that is required to alter policies and programmes in the light of this reassessment. The way in which these stages.are handled in particular planning agencies, depends not only on the way in which monitoring and evaluation is perceived but also on the nature of organizational structures and the allocation of functional responsibilities. The first and second stages of this process may be combined in some cases, particularly where monitoring and evaluation tasks are largely carried out by those responsible for implementation. In other cases, however, the second stage may be carried out by a specially constituted working party that has little contact with those concerned with monitoring and evaluation. The next section of this paper considers the organizational implications of monitoring in more detail. In the meantime, the essential point that must be noted is that the nature of reporting procedures is inevitably very closely connected to the requirements imposed by organizational structures.

Nevertheless, reporting procedures can be discussed in general terms if these considerations are kept in mind. In the main, two very different requirements must be met by the reporting procedures that are developed for monitoring and evaluation purposes. Firstly, there is a need for reports on particular issues that require immediate attention. These may take the form of in-depth studies or short memoranda and briefing notes. The essential feature of these reports is that they are produced for a particular client within the organization and their circulation is often restricted to these clients. Secondly, there is a need for more general reports that give an overview of events regarding the progress of the plan or programme. These may be in the form of statistical information or, more frequently, a general position statement that summarizes developments on matters relevant to the planning agency. In contrast to the issues reports, these reports are often produced in relatively large quantities and circulated widely not only within the agency itself but also to a wider audience in the region as a whole.

The extent to which these requirements are met in practice is illustrated in Table 6.4, with reference to the monitoring of a rural development project in Swaziland where three different kinds of reports are prepared by those concerned with monitoring and evaluation. In the first case, there is the preliminary field manager's report. This usually consists of about three to four pages plus tables. Secondly, briefing memoranda of two to three pages are prepared focusing on particular issues. Thirdly, a comprehensive report of about fifty pages is also published. The preliminary reports provide the basis for discussions between individual field managers and central management. These are not circulated to anyone else inside or outside the agency. The main use that is made of this report is by the field manager himself in evaluating the progress of his work. Briefing memoranda are mainly used by central management and government policymakers who are concerned with overall project planning and implementation matters. These memoranda are also made available to field managers and funding agencies involved in the project to inform them of developments. In contrast, comprehensive reports are largely used by external consultants and outside research workers who are interested in the project. Apart from this, only a limited amount of use of these reports is reported by specific field managers and funding agencies.

TABLE 6.4. CIRCULATION AND USAGE OF DIFFERENT TYPES OF MONITORING AND EVALUATION REPORT IN SWAZILAND RURAL DEVELOPMENT PROJECT

	Types of Report		
Users	Preliminary Report	Briefing Memorandum	Comprehensive Report
Specific field managers	much	some	some
Other field managers	not distributed	nil	nil
Central management	some	much	nil
Government policymakers	not distributed	much	nil
Donors:			
Project supervisors	not distributed	some	nil
project identifiers	not distributed	some	some
Others	not distributed	not distributed	much

Source: Guido Deboeck and Bill Kinsey, "Managing Information for Rural Development: Lessons from Eastern Africa" (Staff working paper; 379) (Washington, D.C.: World Bank, 1980), p. 38.

When considering the use that is made of these reports, it is important to bear in mind that the critical factor that must be taken account of, is the extent of the influence that they exert upon decision makers. This involves assessing the invisible products of monitoring and evaluation that arise as a result of personal contacts and networks as well as the visible products that are evident in reporting procedures. In addition, it will be necessary to find the right balance between the emphasis that is given to issues reports and that for position statements. From the standpoint of strategic monitoring, then, it can be argued that,

> too much attention to what may be termed the visible products may result in a process that is superficially impressive with respect to the number of published reports that can be handed to visitors; its influence over decision makers may nonetheless be only marginal. On the other hand, an output that is measured chiefly by the number of memoranda prepared for senior officers may reflect a process that is largely responding to crises, and failing in its primary task of anticipating problems so that they can be investigated before the pressure for a decision or a commitment has become irresistible....45/

Features of Issues Reports

The preliminary field manager's report and the briefing memoranda described in the Swaziland example are two types of issues report. The other main type of issues report is the in-depth report on a particular topic of concern. Given the time constraints placed on decision makers, the presentation of material in in-depth reports requires careful consideration. Problems are likely to arise as a result of the need to provide enough information to enable readers to evaluate the evidence for themselves while not overwhelming them with detail. However, these difficulties can be resolved to some extent by separating the details from the main body of the report, and placing it in appendices and/or by the inclusion of a very detailed and clear listing of contents.

Although its significance will vary according to the nature of these reports and the issues that are involved, confidentiality is likely to be a major consideration in the treatment of most issues reports. As the results of most planning activities are usually neither as good nor as bad as their critics allege, there is always a danger that the publication of findings that show a partial failure in policy implementation may jeopardize the future success of the whole exercise. As the United Nations sourcebook notes, "for many decision makers, the data themselves are less worrisome than the possibility that they may be published."46/

In most cases, the initial reporting stage is concerned largely with raising issues that require further consideration by the organization. A typical example of the issues raised by strategic monitoring in an English county is contained in Appendix D. From this, it can be seen that most of the issues raised require more detailed investigation that will lead eventually, to the publication of in-depth reports containing recommendations for changes in policy. For example, it will be necessary for the planning authority to revise its residential land allocation policy as a result of finding out that the rate of housebuilding is higher than expected and the total number of planning permissions granted for housing is also higher than intended. In other cases, the findings of monitoring and evaluation raise a number of more general issues regarding the future direction of planning policy. For example, they point to the need to take steps to roll forward the plan to the end of the century in order to provide a long-term framework for planning and investment in the region.

Features of Position Statements

There is a strong case for publishing regular position statements on planning matters for general circulation, particularly where strategic monitoring rather than performance review is involved. The frequency of such publications is often dictated by the cycle of operations within the agency. In the Dutch National Physical Planning Agency, for example, monitoring and evaluation activities are governed by the need for the Minister of Housing and Planning to report to the Dutch Parliament at the beginning of each parliamentary year in the autumn. This requires that the basic tasks of data collection must be completed by the beginning of February so that information analysis and policy evaluation can be carried out by the monitoring and evaluation groups between February and May. This leaves the period from May to September free for the preparation of the Minister's statement.47/ Even in cases where the activities of the planning agency are relatively unconstrained, there is a general consensus that an annual position statement should be published if possible. For example, the Working Party on Structure Plan Monitoring set up by the Scottish Development Department "strongly recommends that each Structure Plan Authority should prepare an annual monitoring report which will summarize the progress made in the implementation of the Structure Plan."48/

The range of topics that is covered in a typical annual position statement for an English county can be seen from Appendix E. This classifies subjects according to their origin. From this, it can be seen that topics directly arising out of policy monitoring form only part of the material covered in such a report. This is because it is also necessary to take into account the consequences of developments at both the national and regional levels that affect planning in the county. At the same time, the implications of events in adjoining areas and actions by the lower tier district councils must be considered. Even within the local authority, decisions have been taken in other departments that have consequences for planning activities and there are also a number of issues that are raised by internal research carried out by the planning department itself.

In many cases, the position statements that are prepared for strategic monitoring purposes are used as a vehicle for consultation procedures with other agencies involved in the planning process. This is particularly important in the case of a two-tier local government system where position statements can be utilized as a device to stimulate feedback from the lower to the upper tier. In some cases, these position statements may be seen as only part of a more general information service that is provided on planning matters to interested parties in the region. In Hertfordshire, for example, the County Planning Department also arranges a series of technical seminars with business and commercial leaders on topics raised as a result of its monitoring activities.49/

Summary and Conclusions

Four main points emerge out of the discussion on reporting procedures.

1. Reports on the findings of monitoring and evaluation form only part of a three-stage process that leads to policy reformulation. The nature of reporting procedures used in different kinds of planning agency reflect the way in which these stages are treated in organizational terms.

2. Two different kinds of requirements can be identified for reporting purposes. Firstly, there is a need to supply decision makers with issues reports that enable them to take the necessary corrective actions. Secondly, there is also a need for more general position statements that summarize the progress that is being made towards plan implementation and fulfill more of an opinion forming role. Whereas issues reports are largely designed for internal consumption and are likely to have a restricted circulation, position statements are intended mainly for external consumption and are likely therefore to have a wide circulation.

3. Confidentiality is a critical factor in the preparation of issues report.

4. Position statements that take account of a wide range of factors impinging upon planning as well as the findings of policy monitoring should be published regularly. Position statements of this kind are a useful vehicle for consultation purposes in that they stimulate discussion and help to form opinions regarding planning matters.

ORGANIZATIONAL STRUCTURES

General Principles

It will be apparent from the earlier discussion that there is no one best organizational structure that can be recommended for monitoring and evaluation purposes. Because of this, organizational structures must be designed that take account of a wide range of circumstances surrounding monitoring and evaluation activities. These include the managerial requirements that are imposed by the specific tasks involved, the overall structure and functions of the planning agency, the bureaucratic culture and working practices of the agency, and the nature of the agency's relations with politicians and leaders of business and community interests in the region.

Nevertheless, it is possible to set out a number of general principles that can be used in the design of organizational structures. Two basic stages in organizational design for monitoring and evaluation are generally distinguished.50/ In the first of these stages, the range of monitoring and evaluation processes that is required must be identified. Of particular importance in this respect, is the relative weight that must be attached to strategic monitoring activities as against performance review tasks within the process, as this is likely to determine the way in which the four main tasks (problem definition, data collection, information management, and reporting procedures) are carried out. Given this task definition, then, the main objective of the second stage is to design organizational structures that reinforce these processes and create links with the other activities that are being carried out by the agency. Under certain circumstances, it may be necessary to develop organizational forms that cut across the sectional structures that exist in most planning agencies, so that monitoring and evaluation groups are created that have direct access to the information available in all parts of the agency.

> Organisational forms which emphasise inter-group, project working facilitate monitoring, since they are potentially capable of obtaining information from a variety of sources throughout the organisation -- from field staff actively involved in interventions which provide feedback about the impact of policies and actions, and from outside organisations.51/

The extent to which the work of those involved in monitoring and evaluation should be integrated with that of those responsible for policy implementation depends very much on circumstances. There is a strong case for a high degree of integration where there is a strong corporate identity within the agency. This is particularly necessary in connexion with large-scale project management where performance review forms part of the budgetary control process. There are also advantages of a close integration of monitoring and implementation activities from the standpoint of strategic monitoring. The task of problem definition in this case is made much easier by the familiarity and involvement of monitoring staff with the aims and objectives and main points of emphasis of planning policy. Staff working in this kind of organizational structure can also make use of their existing contacts with people outside the agency who are involved in planning. Because of this, outside agencies are more likely to be forthcoming in their views than might be the case where they were approached by staff with whom they had had no previous contacts. However, perhaps the most important benefit of integration is that the findings from monitoring and evaluation are likely to be more acceptable to those involved with implementation because they come directly from within the groups involved. Consequently, they are less likely to be treated with the hostility that can develop in some cases where the findings of independent monitoring and evaluation groups are concerned.

On the other hand, there is an obvious conflict of loyalties in situations of this kind. Members of interdepartmental monitoring and evaluation groups have to fulfill their sectional and departmental obligations as well as their obligations to the interdepartmental group. It can also be argued that there are essential differences between the qualities that make up a good evaluator and those that are required for implementation purposes.52/ This is because personnel concerned with evaluation are essentially interested in the promotion of change and the reformulation of policies, whereas those involved in implementation judge their achievements by their success in carrying out existing rather than future policies. For this reason, implementers require stability rather than changes in circumstances to be able to operate effectively. These differences are also evident in the contrast between the commitment that is generated by implementation and the scepticism that characterizes monitoring and evaluation.

Given these practical problems, it is not surprising to find in many circumstances that interdepartmental working groups of this kind are concerned as much with justifying their previous actions as with identifying deviations from expected policies that require corrective action. The alternative strategy that can be adopted towards organizational design is therefore to develop structures for monitoring and evaluation that are detached in some measure from the other activities of the agency. This enables staff to be specially appointed for monitoring and evaluation purposes who have an independence of operation that promotes a much more critical and questioning attitude towards implementation activities. The desirability of developing these qualities has been summed up by one English County Planning Officer in the following terms:

> (Monitoring) has an ongoing role of striving to understand current changes, anticipating future decisions by investigating the impact of actual or potential decisions, to the need to consider existing, or create new policies as necessary. The monitoring activity is separate from policymaking in order to have the power and the capability to 'rock the boat' by continuously questioning the validity of county planning policies.53/

However, it can be argued that there are serious disadvantages in adopting such a position, particularly because of the potentially sensitive character of the relationship between those involved in monitoring and evaluation and those concerned with implementation. This may give rise to internal conflicts which reduce the effectiveness of monitoring and evaluation. In this respect, it is important to remember that those concerned with implementation provide one of the most important sources of information that is needed for monitoring and evaluation. For this reason, they are able to exert an influence on these activities by withholding or doctoring information that is provided for these purposes. Equally, those concerned with implementation are likely to occupy an important position when it comes to interpreting the recommendations of monitoring and evaluation. Where relations between the two sides are strained, those concerned with implementation have at their disposal a whole battery of arguments that they can use to delay a final decision on the recommendations of those concerned with monitoring and evaluation. Consequently, "to be successful, such a group would seem to need high level backing in order to sustain its position and stance, and being self-contained, might prove inhibiting to close integration with implementation processes, with interorganizational activity, and with the corporate processes of the authority.54/

Problems of this kind are likely to be accentuated where external agencies such as outside consultants or a university department are given the task of carrying out monitoring and evaluation. With these considerations in mind, the following list of nine criteria was developed by the participants in the Workshop on Rural Development Monitoring in Eastern Africa to assist in the choice of organizational structure:55/

1. an ability to communicate the findings of monitoring and evaluation to management;
2. a measure of objectivity and independence in carrying out monitoring and evaluation studies;
3. an available pool of skills;
4. a potential to contribute to further institution building;
5. a high likelihood of timely results;
6. a degree of familiarity with daily project activities;
7. the need for continuity or discontinuity of operations, as is the case where projects of a limited life are being considered;
8. the costs involved; and
9. the degree of accountability of those involved in monitoring and evaluation.

In practice, it is often necessary to think in terms of a two-tier rather than a single-tier structure for monitoring and evaluation purposes. The lower tier of this structure involves activities that are closely integrated to sectional requirements, whereas the upper-tier functions as a general policy evaluation unit at the agency-wide level. This reflects in some measure the distinction that has been made throughout this review between performance review and strategic monitoring tasks. The main functions of monitoring and evaluation at the lower tier will relate to performance review, whereas strategic monitoring will constitute an important element of upper-tier activities.

The Operations Room Approach

The concept of an operations room both illustrates and develops the general principles described above in relation to organizational structures, in that in this case the tasks of monitoring and evaluation are also expressed in the form of a physical entity. The general idea of an operations room was first suggested to Branch56/ by the Combat Information Centre on aircraft carriers that he observed as a naval officer during the Second World War. These centres reflected the need to be able to rapidly collate incoming information about a wide range of activities in order to take the necessary actions as quickly as possible. In effect, the operations room serves as the nerve centre of the organization and Branch suggests that a similar approach could be adopted towards urban planning activities. He suggests that a city planning centre should be established that should be located close to the seat of management decision making, in a position that makes it as accessible as possible to those involved. Such a centre would seek not only to provide users with the most up-to-date information but also to stimulate feedback as a result of discussions on the significance that must be attached to this information.

> Ideally, the centre should be the place where these people can stop by regularly to review current information and analysis; obtain and contribute specific information; attend informal work sessions, staff meetings, public hearings, and presentations; or take part in formal decision making.57/

A good example of the working of the operations room concept in practice can be found in Malaysia,58/ where it has been used by the Ministry of Rural Development as a vehicle for its development committees to review progress in connexion with a wide range of rural development projects. The concept has been applied to monitoring and evaluation at the district, state, and federal levels. At the federal level the national operations room initially contained maps and charts of each state, displaying the details of location of the development projects that were currently being implemented, together with information on the progress that had been achieved towards implementation, that had been collected by means of a standardized progress reporting system for all projects. Subsequently, this national operations room has been replaced by a new one in which project information is shown by means of visual display units connected to a computer and there are also facilities for the presentation of material in the form of films, slides, and videotapes. The new national operations room also includes an auditorium where briefing sessions can be given to groups of politicians and officials from states. As a result, the function of the operations room has changed.

> From its inception NOR served a fundamental purpose as a repository of the progress of development and the mechanism to engender greater efforts. Under Hussein Onn the NOR has been given an even greater

> role. Through the use of improved techniques in film and video, the district and the locality can now be brought to the operations room. Ministers and officials, can, as it were, 'inspect' from the centre. It must be noted that immediate feedback is no longer given and 'on the spot' solutions cannot be suggested, but such comments as are made by the centre will go back to the locality via the appropriate department or agency.59/

It should be noted that, while the concept of the operations room is an attractive one from the point of view of monitoring and evaluation, its effectiveness as a device for promoting these activities depends very heavily upon its place within the organization as a whole and the influence that is attached to those involved in the monitoring and evaluation process. In many circumstances relating to urban planning, it would be dangerous to equate the executive powers that are at the disposal of the captain of an aircraft carrier with those of the mayor of a large metropolis in a developing country. Because of the wide diversity of agencies that are involved in plan implementation, the essential difference in the urban planning case is that strategic monitoring is concerned at least as much with the coordination of other agencies' work as with direct action on behalf of the agency itself.

Staffing

There are considerable advantages to be gained from some measure of detachment from the staffing viewpoint. In cases where separate units are being set up for monitoring and evaluation purposes, it is possible to hire staff specially for this purpose. This means that some of the specialist skills associated with survey design and information management in particular can be brought into the organization as a whole. In more general terms, the findings from a role playing exercise on interviewing candidates for the position of monitoring evaluation officer that was conducted by participants at the East Asian Workshop on Monitoring Rural Development suggests that four particular characteristics are felt to be of considerable importance from the personnel standpoint.60/ These are

1. training in one of the social sciences and experience in field studies;

2. a high degree of sensitivity to the needs, values, and ways of expression of the recipients of planning actions;

3. the commitment and courage to signal shortfalls in project performance, even if risks are involved; and

4. an awareness of the importance of the integrity and credibility of the evaluator's status.

At the same time, it is also useful to take account of the different staffing requirements imposed by different types of monitoring activity. The Institute for Operational Research argues that different qualities are required for each of the three main types of monitoring activity found in English structure planning.61/ For the monitoring of issues of concern, there is a need for a higher proportion of experienced officers drawn from a wide range of disciplines in the field of social sciences. For policy monitoring, it is particularly important to have experience of working in other sections of the planning agency. In contrast, analytical skills rather than operational experience are likely to be of special importance in connexion with the monitoring of uncertainties. It is also likely that the average age of this group will be considerably lower than that of other groups.

As monitoring and evaluation is likely to be a multidisciplinary activity, it is important that very careful consideration is given at an early stage in the formulation of personnel policy to the career development opportunities for the staff involved. This is because the specialist nature of some of the tasks within monitoring and evaluation is likely to inhibit the prospects of promotion within the group as a whole.

Finally, it must be recognized that in many cases it will be necessary to call in outside consultants to assist in monitoring and evaluation, given the limited resources that are available in many developing countries. Specialist advice is likely to be particularly necessary with respect to the development of survey design and data collection procedures and for the design and implementation of information management systems. Wherever external consultants are being employed in the monitoring and evaluation process, their terms of reference should be defined in such a way that makes it clear who they are accountable to and what they are accountable for.

Summary and Conclusions

Five main points emerge from the previous discussion on organizational structures.

1. There is no one best organizational structure for monitoring and evaluation. The choice of an appropriate form for a particular set of circumstances

will be dependent on a variety of factors reflecting the nature of the tasks involved, the working processes of the planning agency, and the external environment within which it operates.

2. The main tasks in the design of organizations for monitoring and evaluation is to identify the range of activities that is required and to devise structures that reinforce these activities.

3. An important factor governing the choice of organizational structure is the degree to which it is felt that monitoring and evaluation should be integrated into other planning activities. The basic advantages stemming from a high degree of integration are offset to some extent by the danger that monitoring and evaluation will be largely trivial and ineffective in character. On the other hand, the advantages of having a high degree of detachment are also offset in some measure by the danger that monitoring and evaluation activities will become remote from reality.

4. In many cases it will be necessary to think in terms of two-tier structures for monitoring and evaluation. This implies the establishment of a lower tier that is closely integrated to implementation and concerned largely with performance review activities and an upper tier that forms part of the corporate management structure for the agency as a whole and deals with strategic monitoring as well as performance review.

5. One of the main advantages of establishing separate monitoring and evaluation units is that this makes it possible to hire specialist staff for this purpose. Nevertheless, in many cases, lack of resources means that it will be necessary to resort to outside consultants particularly for assistance in specialist areas such as survey design and information management.

DIRECTIONS FOR FURTHER RESEARCH

The main points that emerge from the preceding discussion have been summarized at the end of each section of the paper and there is little to be gained by reiterating them therefore at this stage. Nevertheless, the study as a whole raises some more general questions regarding possible needs for further research that require attention. The most important of these concerns the relative lack of well-documented and detailed case study material on urban planning and decision making processes in developing countries as a whole. It should be borne in mind that Taylor and Williams drew very heavily on their own extensive range of experience in planning practice in their analysis as well as upon the limited amount of case study material that is contained in their work.62/ In order to test the validity of their findings it is necessary to consider much more detailed investigations of a limited number of carefully selected cases that can be used as benchmarks for a more general evaluation of planning experience. Preferably, but not necessarily, these case studies should be chosen as examples of "best" practice. In-depth studies of this kind are essential both to highlight the characteristics of the planning and decision making processes that are involved and also to draw attention to the problems that must be resolved in future practice.

NOTES

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APPENDIX A. AN EXAMPLE OF A SET OF PERFORMANCE INDICATORS USED IN STRATEGIC MONITORING

GENERAL EMPLOYMENT

Implicit Monitoring Objective

To impose limitations on the increase in the number of jobs in the county in order to move towards a better balance between housing and employment. This better balance is to be achieved by preventing the introduction of new employment generation into Hertfordshire and by limiting the expansion of existing Hertfordshire firms. Further scope for growth is to be used for the benefit of those firms already located in the county or for the provision of essential local services.

Policy Number 3

Where a significant increase* in employment is proposed, permission will be refused unless it can be proven to the satisfaction of the local planning authorities that it is essential in the national or regional interest, and desirable in the local interest, for that activity to be located in the county. In assessing the national or regional interest, the local planning authorities will have regard to the views of central government.

Subsidiary Guideline

Specific employment activities will be controlled by the application of the more specific policies which follow.

Performance Measures

(a) information on the size of the firm's intended employment growth, present location, its market area of distribution or servicing, and locational needs of the firm intending expansion or new location in the county; information to be obtained from planning application and any follow-up enquiries for additional information.

(b) Information on each major proposal from the Department of Industry or DOE or other government department on the justification for growth in the national or regional interest.

(c) Size of employment growth assessed against existing employment commitments and labour supply growth and the labour demand/supply position as derived from monitoring of the plan's assumptions. This will be examined by monitoring policy areas, on an annual and three-year rolling average.

Performance Criteria

(a) No significant employment growth allowed to existing firms or to those not already located in the county, unless it relates to local servicing needs or is clearly and exceptionally required for national, regional, or local needs.

(b) Employment growth only occurring within the expected labour supply levels taking into account commitments of employment growth in a policy area.

Note: * In assessing whether a change is significant, regard will be paid to the following criteria within the policy area: 1. The annual rate of change of labour supply; 2. The relative annual rate of increase of housing for the economically active; 3. Recoupment of any excessive growth in previous period; and 4. Other competing need for labour supply.

APPENDIX B. EXAMPLES OF INFORMATION REQUIREMENTS

PRIMARY TASKS OF MONITORING

To demonstrate progress in the application of structure plan policies and proposals: This is the most immediate purpose of monitoring. Indeed the application of structure plan policies may itself depend upon monitoring information (for example, where a limit to new housing is set in a community, implementation of this policy requires information on how any one planning application relates to the threshold).

Examples: development control decisions; records of rates of development; record of land availability.

To test their effectiveness in relation to the structure plan's key issues and main objectives: Information chosen will be dictated by the nature of the policies and their relationship to the key issues and main objectives. Records of decisions and actions taken, and policies adopted, by Regional and District Councils and other agencies under the framework of strategic land use set out by the Structure Plan will be the kind of information needed. Special information collection may be necessary to monitor particular projects, programmes, or policies while others may be able to rely on existing information flows and sources.

Examples: council capital programmes; TPPs and housing plans; local plan preparation; housing returns; records of rates development of progress in specified projects; records of land availability; regular information from service departments.

To test the relevance of structure plan policies and proposals in the light of change: Requires a broad scan of all types of social, physical, economic, and environmental information related to the structure plan and the political and administrative framework in which it operates. The information must be able to be interpreted by the planning authority to determine, for example, whether the plan is out of date, whether it should concentrate on new issues, or whether it should retain its original objectives but amend certain policies. Information here includes awareness of political change, of public reaction, and of how the plan is operating; much of it may be in the form of intelligence rather than facts and figures.

Examples (awareness of political change): central government circulars; new legislation; policy and organizational changes in the public or private sector; (new understanding) review of forecasts; programme and reports of agencies, nationalized industries, etc; records of planning applications not in accord with structure plan policy; resources for implementation; current awareness of academic literature and the experience of other authorities; (public reaction) public reaction to events through national and local press; results of publicity and consultation procedures.

To test the validity of the assumptions that led to the definitions of the key issues and main objectives of the structure plan: Requires hard factual information on the principal physical and economic characteristics of, and influence on, the structure plan area. It will include the latest projections based on these facts and most probably involve the updating of material in the Report of Survey.

Examples: Registrar General's annual mid-year estimates and projections of population; Department of Employment Statistics; national census; review of forecasts of housing demand and supply; employment demand and supply; settlement populations.

Source: Scottish Development Dept., Structure Plan Monitoring. Report of a Joint Working Party (Edinburgh, 1979).

APPENDIX C. AN EXAMPLE OF A RECORD HELD IN A QUALITATIVE INFORMATION MANAGEMENT SYSTEM

Select Parameters:
Data Range 1/80 - 3/80
Subjects 14

Date 2/1/80

Subject 01 13 14 39 46
70 # # # #

Location HT - SE - UK - #

Policy Area # Issue # Source E. Echo

Content House market will improve in the spring. Despite recession in the industrial and commercial market predicted for the spring, northern home counties should find demand sustained. Housing market is likely to remain depressed at least until the spring when interest rates may be reduced. Increased building costs mean house prices are unlikely to fall.

Source: K. Chamberlain, "Pets in Herts, *Burisa* 43 (1980): 3.

APPENDIX D. A SUMMARY OF THE MAIN ISSUES RAISED BY MONITORING AND EVALUATION IN AN ENGLISH COUNTY

1. The general strategy of preventing the outward spread of the built-up area is being achieved.

2. The rate of housebuilding is higher than intended.

3. Housebuilding on the main development sites is proceeding as intended, but the development of infill sites has been unexpectedly rapid.

4. The total number of planning permissions granted for housing is also higher than intended.

5. The creation of jobs is not significantly constrained by a shortage of land with permission for industrial or office development.

6. Employment policies are required which involve action beyond the mere allocation of land.

7. Further applications for nonspeculative office development which may create new jobs should be supported even though floorspace limits may be exceeded.

8. Shopping floorspace policies for Bournemouth, Christchurch, Poole, and Wimborne only cover the period up to 1986. An interim policy for the four centres is suggested, supporting redevelopment for retail purposes, even though present floorspace limits may be exceeded.

9. Most of the highway, public transport, and parking policies remain relevant, but updating and changes in priority may now be needed, particularly as a result of the high housebuilding rate.

10. Recent government thinking on housing land and greenbelts suggests that land allocations in plans should be kept up-to-date and in line with current trends, and that greenbelt boundaries should be drawn so as to allow for long-term development needs.

11. Changes since 1976, and recent government thinking, suggest that the strategic policies for South East Dorset should not be reexamined.

12. To provide a long-term framework for local planning and investment, the plan period should be extended to the end of the century.

Source: Dorset County Planning Dept., _1983/84 Monitoring Report_ (Dorchester, 1984).

APPENDIX E. A GENERAL CLASSIFICATION OF THE ISSUES COVERED IN THE ANNUAL MONITORING REPORT FOR AN ENGLISH COUNTY

National considerations

e.g., Changes in the forecast growth of GNP
Consequences for new legislation for county

Regional considerations

e.g., Changes in predicted immigration levels
Implications of regional report on waste disposal

Issues arising out of actions in adjoining counties

e.g., Implications of proposal to construct a second terminal at Gatwick

Consequences of the failure to publish review of the Greater London Development Plan

Issues arising out of actions by the districts

e.g., Expected changes in residential land allocations in Ashford District Development Plan

Lack of progress on Thanet District Plan

Issues arising out of actions in other county departments

e.g., Consequences of revised TPP submission

Issues raised by internal research carried out by the department

e.g., Implications of updated population projections

Need for land release to secure adequate provision of aggregates

Findings from policy monitoring

Source: Kent County Planning Dept., 1980 Monitoring Report (Maidstone, 1980).

Chapter 7

THE CAPITAL PROGRAMMING PROCESS AND ITS IMPLEMENTATION

Larry Reich

The case study that I would like to discuss is a special purpose one that deals with the capital programming process and its implementation. The City of Baltimore has been using a capital programming process for the scheduling of projects that make up the city's infrastructure for the past twenty years. The two aspects of the capital programming procedure that I would like to discuss in detail are:

1. The formulation of the six-year programme that includes all of the capital projects that are scheduled to be built that renew and add to basic infrastructure of the city.

2. The management of a capital programme implementation process by reporting, scheduling, and providing a method of tracking and monitoring the projects.

The programmes have been incorporated in a computer display system which is an integral part of the process (see Appendix A). This process has been in use now for more than five years and has proven to be an effective administrative tool. It seems to me that the adoption of this technique by most planning agencies concerned with the maintenance and construction of the infrastructure, of either cities or regions, would result in a considerable economy and the establishment of a more orderly system of city building.

Capital budgeting is becoming increasingly complicated. While the funding available for certain programmes has decreased, the diversity of funding options has increased. At the same time, needs continue to expand particularly for infrastructure rehabilitation. This has led to a desire for more analysis and a need for rapid testing of assumptions.

THE CAPITAL PROGRAMMING PROCESS AND ITS IMPLEMENTATION

CAPITAL IMPROVEMENT PROGRAMMING

The capital programme is defined as being the guide used by the City in making the necessary physical improvements. The City Charter requires the Planning Commission to annually prepare a six-year recommended capital improvement programme.1/ A capital improvement, as defined by a Board of Estimates' resolution, is

> ...any physical betterment or improvement and any preliminary studies and surveys relative thereto, including, but not limited to, any property of a permanent nature, and equipment needed in connexion with...such...improvement — when first erected or acquired....The terms 'capital improvement' or 'capital project' shall not include the following: projects or improvements costing less than US$5,000, vehicular equipment, items of repair or maintenance nature costing less than US$100,000 or which are of an emergency nature, salaries other than those which are properly capitalized as a part of the project cost.

The recommended capital improvement programme adopted by the Planning Commission is a complete list of physical improvements that the Commission believes the City should fund and build during the six-year period covered by the programme. The list is prepared by the Planning Department after reviewing the requests from the various city agencies. In adding or deleting projects, the Department considers the requests in the light of various adopted plans, the City's overall priorities, the expressed needs of citizens, the merits of each specific project, the financial constraints set by the Board of Estimates' policy, and Federal and State restrictions on the use of intergovernmental funds. Planners try to limit expenditure by seeing that, wherever possible, projects are coordinated with respect to function (for example, joint usage of space), timing (to hold down construction cost), and location (to insure that space is utilized to the City's best advantage). Also, planners try to minimize the City's share of construction costs wherever feasible through federal, state, or county participation.

THE PROGRAMMING PROCESS

Each October, the Planning Department sends Capital Budget Information forms to all city departments. These forms are used to prepare the capital requests which are due by 1 December. A fully completed form will contain all the information needed to begin to review and evaluate the project. However, a request stands a greater chance for consideration when it is carefully thought out and well planned. Here are some recommended steps that department heads should take to develop a more finely tuned capital request.

1. Work with the planner assigned to your agency by the Planning Commission. Meet with them during the summer months and discuss your thoughts on future projects as well as current ones. Work with them and develop a long-term strategy for your agency. Determine the type and kinds of background information needed for each project. This would include studies and surveys necessary before actual work can begin. The planning staff is a resource that can be used by your agency throughout the budgeting process.

2. Use your current capital appropriations to guide future requests. Know the current status of each project. Are current appropriations available and sufficient to complete previously approved projects? Are current appropriations available for new projects?

3. Start with last year's approved six-year capital improvement programme. The previously approved capital improvement programme always shows a recommended schedule of funding six years into the future. Each year you should start with that schedule when developing your requests.

4. Weigh each request carefully! Before you submit your capital budget ask these questions where appropriate about each project:

   (a) Will this project improve fire and safety protection?

   (b) Will this project reduce future operating costs?

   (c) Will this project leverage non-City funds?

   (d) Is this project necessary to comply with federal or state mandates?

   (e) Will this project increase future revenues?

   (f) Is the estimated cost of this project over US$100,000?

   (g) Will construction begin within the same year funds are requested?

(h) Is the estimated cost of this project along with others requested within available funding levels?

(i) Will this project result in more efficient and effective service?

(j) Is this project necessary to replace obsolete facilities?

(k) Is the project consistent with your agency's published plans?

(l) Has coordination with other agencies taken place where necessary?

(m) What is the community sentiment?

These questions are used by the Planning Commission and its staff during its review of projects.

5. Submit your request on time! Plan to submit your official request on or before 1 December. This will insure that the Planning Commission can thoroughly review each project before making recommendations to the Board of Estimates in February.

These steps will provide an excellent framework for developing a capital improvement strategy for the department. As a result, the capital improvement planning process becomes less time consuming, simpler, more productive, and of greater value in managing the department.

After specific projects have been reviewed and found to be consistent with these criteria, the total cost of the project often exceeds the funds available for it. In such cases, the staff must assign priorities to specific projects or groups of projects. In determining priorities, the planners assess where the greatest need exist and where the City will benefit most from a project. Consideration is given to the relative deficiencies in facilities or services operating in specific functional areas and serving specific geographic areas or specific age and income groups. Also considered is the relative effect a project might have in relation to various objectives of the City — for example, a new road might make vacant industrial land accessible and hence available for development thereby increasing the tax base. Finally, the planners consider the impact of each separate project on the other projects and programmes — for example, by constructing a recreation centre adjacent to a school, the City may reduce the capital and operating cost of both facilities.

On the basis of all these conditions, certain projects are included as requested in the programme, others are rearranged within the six-year period and still others are not recommended for inclusion in any six-year programme.

As the staff recommendations are formulated, they are presented to the Capital Improvement Programme (CIP) Committee of the Planning Commission for discussion regarding both overall policy and the merits of individual projects. After review and modification by the CIP Committee, the six-year programme recommendations are presented to the full Planning Commission for review.

During the Planning Commission's review of the staff's recommendations, agencies are requested to make presentations of their programmes to the Commission. After weighing all considerations, the Commission adopts a six-year recommended programme which is printed and forwarded to the Board of Estimates (see Appendix A).

After receiving the Planning Commission's recommended programme, the Board of Estimates forwards the programme to the Director of Finance and the Board of Finance for review and recommendations. Once the recommendations of the Finance Director and the Board of Finance have been received, the Board of Estimates officially adopts the six-year programme. The Board of Estimates' approval does not legally bind the City to appropriate funds. Only City Council approval of the first year of the programme as part of the Ordinance of Estimates (City budget) actually commits the City to finance projects. (The adopted first year then becomes the City's capital budget.) However, since the Board of Estimates is composed of the Mayor, the President of the City Council, and the Comptroller, adoption of the capital improvement programme by the Board of Estimates indicates a serious commitment on the part of the City to implement the projects in the six-year programme.

The first year of the programme represents the Board's recommendations on the capital budget, which, along with the recommended operating budget, is sent to the City Council. The recommended six-year programme is also forwarded to the City Council to assist the Council in its review of the capital budget by providing a reference document showing anticipated future projects. The capital budget adopted by the City Council and the remainder of the six-year programme adopted by the Board of Estimates together constitute the City's official capital improvement programme.

THE CAPITAL PROGRAMMING PROCESS AND ITS IMPLEMENTATION

BENEFITS OF CAPITAL PROGRAMMING

Briefly, the benefits deriving from this process are:2/

(a) Implements the City's comprehensive development goals. (Comprehensive Plan)

(b) Encourages early review of priorities.

(c) Provides opportunities for coordination among projects with respect to location, function, and timing.

(d) Indicates where sites for projects are needed and where advance acquisition should occur.

(e) Provides for long-range financial planning by facilitating reliable capital expenditure and revenue estimates.

(f) Fosters operations planning by each agency — since facility needs can only be determined by evaluating whether particular operating programmes should be expanded, limited, revised, or replaced, the necessity of submitting six-year capital requests fosters such evaluation.

(g) Sets a framework for managerial decisions — in looking ahead six years to see what facilities should be constructed, agencies are forced to simultaneously determine the increased operating expense produced by the construction of new physical facilities and seek ways of operating the new facilities most effectively and efficiently.

(h) Provides a vehicle for presentation of the City's programmes to other jurisdictions and levels of government.

BALTIMORE'S CAPITAL IMPROVEMENT PROGRAMME MANAGEMENT

Facing the problems of fighting double digit inflation, balancing the budget, holding the tax rate, and maintaining the level of city services, the Mayor of Baltimore City decided that a way to hold down city expenditure was to control costs and time overruns in the execution of capital projects. Thus, early in 1974, the Mayor appointed a Capital Improvement Programme Management Team consisting of the Physical Development Coordinator, the Director of Finance, and the Director of the Department of Public Works and the Planning Department. This team was directed to establish a system to better monitor the status of capital projects, to insure strict project cost control, and to devise new methods for controlling the city resources for capital project implementation.

Baltimore City's operational capital improvement system is divided into a programming process and a management process. The capital improvement programming process, which is the responsibility of the Department of Planning, from submission of agency requests to adoption of the capital budget by the City Council, takes approximately nine months and requires a substantial investment of time and energy by all city agencies. Each year the programme is updated to add new projects in the sixth year to reevaluate programme and project priorities, and to revise recommendations to take account of new requirements and new sources of funding. This is the programme that has been described in the first part of this paper.

The management process, which guides the implementation of capital improvement projects, is also embodied in the city administration's basic organizational structure. Each city agency which sponsors capital projects is primarily responsible for their successful completion. The Physical Development Coordinator, a cabinet level position in the Mayor's Office, is directly responsible for coordination of the implementation of the capital improvement projects. Project fiscal control is vested in each sponsoring agency with overall fiscal control being exercised by the Department of Finance, with approval by the City Board of Estimates.

The CIP Management Team designed and implemented a system that would meet the following objectives:

(a) convenient, efficient display of project data;

(b) standard milestones for all projects;

(c) application of Critical Path Method (CPM) techniques for project scheduling; and

(d) different levels of data as required by the city management hierarchy.

The Planning Department serves as coordinator for system implementation because the activities are a natural extension of the capital improvement programming process. The immediate benefits to city management are:

(a) A data base of project information;

(b) Specific reports for every level of management;

(c) Consolidated information flow;

(d) The ability to respond to problems at optimum time;

(e) A strong base to use for modelling financial impact of budget decisions;

(f) A greater confidence in the accuracy of the data by all levels of management;

(g) A capability to produce any type of report required; and

(h) A basis for upper management to utilize Management by Objective techniques.

Probably the strongest benefit of the system is the intangible feeling of greater confidence and cooperation between agencies that will result in a more efficient operating environment for all.

Appendix B describes the capital project monitoring system.3/

NOTES

1/ See Article VI, Section 2d/2.

2/ See Baltimore's Development Program, 1985-90, which describes capital improvement programming, provides a summary of the 1985-90 capital improvement programme, and lists and describes projects endorsed by the Board of Estimates for the period.

3/ See George D. Becker and John Moscato, "A Summary Description of the Project Data Display System and the Project Scheduling and Tracking System" (Baltimore: Dept of Planning: Dept. of Public Works, 1979); and the Baltimore City Mayor's "CIP Report, 19 September-12 October 1984."

THE CAPITAL PROGRAMMING PROCESS AND ITS IMPLEMENTATION

APPENDIX A. ON-LINE REAL-TIME CAPITAL PROGRAMMING SYSTEM, CITY OF BALTIMORE, MARYLAND, U.S.A.

Key Participants: Baltimore City Department of Planning

Problem: Capital budgeting is becoming increasingly complicated. While the amount of funding for certain programmes has decreased, the diversity of funding options has increased. At the same time, needs continue to expand particularly for infrastructure rehabilitation. This has led to a need for more analysis and rapid testing of assumptions.

Response: In order to provide planners with more time to devote to analysis and a rapid review of changes suggested during the budgeting process, an on-line real-time programme was developed to update and access data. Besides "logging-on" with security, the system provides a complete set of instructions on its use. Data is developed on a project-by-project basis. For each project, a description, expenditure schedule, and appropriation schedule is developed. The appropriation schedule is changed for each successive recommendation. Adjustments can be made to the amount of funding (in thousands), the year of appropriation, and the kinds of funds.

These changes can then be viewed on summary screens by agency, fiscal year, and funding source.

Results: This system was used to develop the 1985 capital budget for Baltimore and the 1985-90 Capital Improvement Programme. Over 550 projects were analysed and over thirty separate funding sources programmed.

APPENDIX B. CAPITAL PROJECT MONITORING SYSTEM, CITY OF BALTIMORE, MARYLAND, U.S.A.

Key Participants:	City of Baltimore, Maryland; Department of Planning; Department of Public Works
Problem:	To better manage capital project implementation by reducing cost/time overruns, improving problem reporting, scheduling and providing one method of tracking and reporting of capital project status. Information on the above should be provided at the optimum time for action before a situation reaches crisis proportions.
Response:	Two systems were developed to solve the above mentioned problems. The first is the Project Data Display System which is an on-line real-time (input/output) system that displays data via Cathode Ray Tube. The seven display screens are the summary, general information, status/schedule, design phase, bid/award phase, construction phase, and management action. Also, this system performs eleven automatic checks for delays on each project. The second is the Project Scheduling and Tracking System. This batch system utilizes Critical Path Method techniques to predict delays in projects. It features the ability to handle many projects simultaneously, use of standard precedence networks that are stored in the system and easily modified to fit any project, and a convenient method of delay tracking and predicting is built into the system.
Results:	The system has been operational for six years and has proven to be a successful tool for managing capital projects. The system was presented at the 1979 American Planning Association conference and is currently being distributed by Public Technology, Inc.

Chapter 8

URBAN TRANSPORTATION PLANNING INFORMATION SYSTEMS FOR USE IN DEVELOPING COUNTRIES

Marvin Manheim and Joseph L. Schofer

INTRODUCTION: THE FRAMEWORK OF ANALYSIS

This paper examines trends in urban transportation planning (UTP) and in information systems technologies. These trends are converging forces which are affecting the strategies, styles, and technologies for UTP information systems particularly in the context of developing countries. These parallel trends are bringing about important new challenges and opportunities for UTP information systems, as reflected in figure 20. In the context of the particular challenges and constraints of planning in developing countries, these trends lead us to reexamine the concept and role of UTP information systems, and to propose a broader concept, the Urban Transportation Information Systems Utility (UTISU), as a more effective, productive, and self-sustaining service function.

This logic is reflected in the organization of the paper. In section 2, recent changes in urban transportation planning in developed and developing countries, including the typical information needs of urban transportation planning studies are reviewed. In section 3, changing information systems strategies are analysed. In section 4, the implications of these trends are examined as a basis for a broader conception of the services to be provided by UTISU, and the ramifications of this concept are spelled out. Section 5 summarizes the conclusions and makes recommendations for actions.

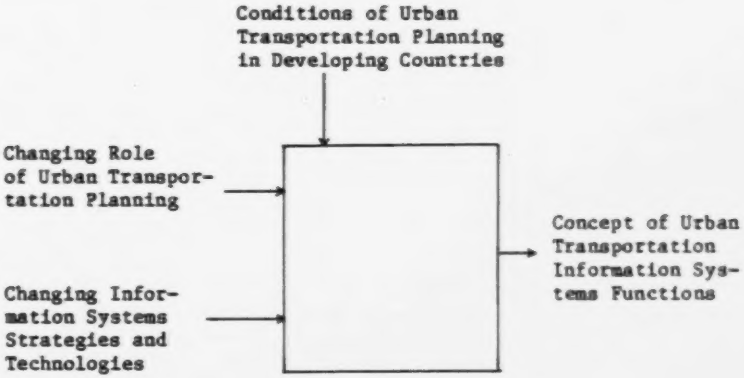
TRENDS IN URBAN TRANSPORTATION PLANNING

Urban transportation planning originated more than thirty years ago as a process for establishing a long-term framework for the development of capital facilities to support the expected transport needs of a region. It was originally conceived as a one-time, or occasional, process which would provide a definitive scheme for physical development of the transport network, usually the highway network. Generally, development of this network was closely coordinated with the development of one or more regional development alternatives.

During the past three decades, a system of computer-supported procedures has evolved to support the forecasting of travel demand and system performance. These procedures are well-known and documented in many sources. They have increased in complexity and sophistication, and in their evolution, have tended to become more demanding in terms of their data, skilled manpower, and time requirements.

We will examine these needs and then look at how they have been changing.

Figure 20. The framework of analysis (urban transportation planning)


Conditions of Urban Transportation Planning in Developing Countries
Changing Role of Urban Transportation Planning
Changing Information Systems Strategies and Technologies
Concept of Urban Transportation Information Systems Functions

The Traditional Process and its Information Needs

A good summary of the traditional view of UTP and its information needs is given in a major survey document published by the Highway Research Board.1/ This document defines the strategic transportation planning process as follows:

> Strategic transportation planning for urban areas is defined as the process of determining a recommended long-range level of investment in transportation, the division of investment between major modes of travel (i.e., between expressways, arterials, and transit), the location of corridors for expressways and rail

rapid transit facilities (or in smaller urban areas the location of arterials), and the general timing and sequence of investments.

To support this process, some twenty-one primary data surveys are typically conducted. The data items typically collected include those shown in table 8.1. Other data often collected are listed in table 8.2.

Based upon their summary of data collection needs, the authors of this study concluded that "the minimum amount of data required to prepare a strategic transportation plan" is that shown in table 8.3. (Primary data is that typically collected by the UTP study, while secondary data is assembled from other sources, as in table 8.4.)

TABLE 8.1. MAJOR PRIMARY DATA SURVEYS

- Travel:
  - Home interview
  - Truck-taxi interview
  - Roadside interview
  - Railroad passenger questionnaire

- Transportation facilities:
  - Arterial link inventory
  - Transit link inventory
  - Intersection capacity studies
  - Speed runs
  - Traffic count programme
  - Parking studies
  - Air-bus-rail terminal studies
  - Goods movement studies
  - Person-miles of travel

- Land use:
  - Land area measurements
  - Floor space measurements
  - Public utilities
  - Soils and surface water
  - Parks and open space studies

- Socioeconomic:
  - Personal opinion questionnaire
  - Household history questionnaire
  - Industrial management survey

Source: Hamburg Creighton Inc., Data Requirements for Metropolitan Transportation Planning (NCRHP report; 120) (Washington, D.C.: National Cooperative Highway Research Program, National Academy of Sciences, 1971).

TABLE 8.2. BASIC UTP DATA ITEMS BY RECORD TYPE

a. Home Interview -- Household Record

Structure type
Type of living quarters
Interview address
Number of persons
Persons age 5 and up
Overnight visitors
Time at present address
Previous address
Time at previous address
Sex
Race
Age 5 and up
Age 5 and up not making trips
Total trips made
Persons age 16 and up
Driver status (age 16 and up)
Number of walking trips
Income
Occupation
Industry
Age
Worked on travel day
Year around resident
Part-time resident; months lived at address
Persons employed
Auto driver trips

b. Home Interview -- Person Trip Record

Sex
Race
Age
Occupation
Industry
Origin location
Destination location
Purpose "from"
Purpose "to"
Land use at origin
Land use at destination
Starting time of trip
Arrival time of trip
Mode of travel
Blocks walked at origin
Blocks walked at destination
Number of persons in car
Kind of parking
Screen line control points

TABLE 8.2 con't

Expressway used
Principal route of travel
First work trip
Expressway exit
Automobile available
Income
Structure
Density
Car pool
Park and shop

c. Roadside Interview

Sample location (station)
Hour period beginning
Direction (in or out)
Vehicle type
Number in vehicle
Trip origin location
Trip destination location
Trip purpose
Land use at destination
Where is vehicle garaged (registered)
Route of exit and/or entrance (through trips)
Screen line crossed (control points)
Truck load
Entrance or exit points to thruway
Land use at origin
Number of stops
Commodity
CBD origin
CBD destination
Through trip
Land use at destination, through trips
Trip purpose, through trips

d. Truck-taxi Trip Record

Sample location
Vehicle type
Garage address
Business -- industry
Number of trucks owned or rented
Total trips reported
Trip origin location
Trip destination location
Trip purpose origin
Trip purpose destination

TABLE 8.2 con't

Land use at origin
Land use at destination
Starting time of trip
Arrival time of trip
Principal route of travel
Truck or taxi loading
Expressway used
Expressway entrance
Expressway exit
Number of stops reported
Commodity carried
CBD origin
CBD destination
Year of manufacture
Unladen weight
Use of pick-up
Control points

e. Land Use Inventory

Address — location
Type of land use
Vacant unusable
Vacant zoned by type
Secondary land use code
Secondary land use of parcels in 100's acres
Number owner-occupied dwelling units
Number renter-occupied dwelling units
Number nonwhite occupied dwelling units
Nonconforming land use code
Number persons dwelling on parcel
Number of uses
Number of secondary uses
Watershed
Dwellings

Source: Adopted from Hamburg Creighton Inc., Data Requirements for Metropolitan Transportation Planning (NCRHP report; 120) (Washington, D.C.: National Cooperative Highway Research Program, National Academy of Sciences, 1971).

TABLE 8.3. PRIMARY AND SECONDARY DATA REQUIRED FOR THE STRATEGIC PLANNING PROCESS

PRIMARY DATA	SECONDARY DATA
Primary population data	Census population
Dwelling places	Birth and death rates
Employment by land use	Number of dwellings and other structures affected
Land use by type	Employment
Person trip destination, by mode	Plans for land uses, by type
Purpose trip destination, by purpose	Zoning maps and regulations
Person trip destination, by land use	Topography and floodplains
Person trip origin and destination	Historical buildings
Truck trip destination, by land use	Barriers map
Taxi-trip destination	Automobile registrations
External vehicle trip destination, by type, purpose, land use	Transit fares
Persons trips by mode by time of day related to auto use	Parking costs
Automobiles available	Travel costs, by road types
Road network	Transit travel cost
Transit network	Accident costs, by road type
Vehicle-miles of travel	Accident costs, by transit type
Person-miles of transit	Road construction costs
Speed-volume data	Transit Construction costs
Screen line volumes	Arterial widths and pavement conditions
Link speeds	Truck registrations
	Transportation plans
	Value of person and vehicle time
	Transit revenue passengers, by type
	Detailed maps and air photos
	Other social values

Source: Hamburg Creighton Inc., Data Requirements for Metropolitan Transportation Planning (NCRHP report; 120) (Washington, D.C.: National Cooperative Highway Research Program, National Academy of Sciences, 1971).

TABLE 8.4. SECONDARY DATA REQUIRED BY THE STRATEGIC TRANSPORTATION PLANNING PROCESS WITH TYPICAL SOURCES OF SUCH DATA

DATA NEEDED	TYPICAL SOURCES
Population data	National Census
Birth and death rates	City or County Clerk
Number of dwellings and other structures affected	Census or local directories; special surveys
Employment data	State Department of Labour
Plans for land uses, by type	City or county planning board
Zoning maps and regulation	City, county, or town planning board
Topographic, floodplain data	Geological Survey
Historical buildings	Special survey may be required
Barriers map	Local planning boards
Automobile registration data	State Department of Motor Vehicles
Transit fares	Local transit company
Parking cost	Special survey may be required
Travel cost data for road types	Published sources (e.g., Transportation Research Board)
Transit travel cost	Local transit company
Accident cost data by road type	Miscellaneous published sources
Accident cost data, by transit type	Local transit company
Road construction cost	State Highway Department
Transit construction cost	Miscellaneous published sources
Arterial widths and pavement conditions	City, County Engineering Departments
Truck registration data	State Department of Motor Vehicles
Transportation plans	Highway Engineering Department
Value of person and vehicle time	Miscellaneous published sources
Transit revenue passengers	Local transit company
Detailed maps, air photos	Highway Engineering Department
Other social value data	Special survey may be required

Source: Adopted from Hamburg Creighton Inc., Data Requirements for Metropolitan Transportation Planning (NCRHP report; 120) (Washington, D.C.: National Cooperative Highway Research Program, National Academy of Sciences, 1971).

The extent and complexity of this traditional approach to UTP reflect the nature of the planning process as it was accomplished in the early 1970s. Roughly this same methodology was applied in more than 400 urban areas around the world. The resulting data base was extremely rich and thus useful not only in UTP, but in many other public and private planning and decision processes. However, it supported a style of UTP which was cumbersome, complex, and costly.

The traditional process began to be questioned in the mid-1970s, on both technical and political grounds. With respect to the technical issues, numerous professionals began to criticize not only the cost and detail of the conventional process, but also the uses of the data that were collected and the nature of the analytical tools (models) that were developed.2/

The limitations of the traditional UTP became most evident in developing countries. The traditional UTP took three to five years to accomplish, under the best of conditions; was expensive; required a number of skilled personnel, especially those with skills in survey design and administration, in quantitative modelling, in running the conventional urban transportation computer models, and in the management of large numbers of unskilled interviewers who did the actual data collection. In many situations, the task of a study was accomplished through heavy use of consultant support from other countries. In the best studies, local nationals were trained in the methods and could continue the study process after the completion of the consultant's tasks; but in others there was little or no effective transfer of technical skills to local personnel.

Evolution of Urban Transportation Planning

In the past ten years, what has been learned about the inadequacies of this rigid process has perhaps been more important than the technical improvements which have been made to it. It has been clear, both in developed countries and developing countries, that the long-term framework plan is rarely implemented as originally conceived; pressures and needs to modify it tend to appear even as the plan is being finalized. One reason for this is that traditional urban transportation planning is often isolated from the political decision making process, which tends to have a more short-term, pragmatic focus. Further, the rapid changes in conditions tend to make the assumptions behind a long-range plan obsolete very quickly, especially in the rapidly-changing urban areas of developing countries. This has led to an emphasis on more short-range, programme-oriented planning.

Furthermore, the focus of UTP on major capital facilities ignores the notions that many other important, short-term, operating and regulatory choices: (a) affect system performance; (b) produce impacts of primary importance to decision makers and citizens; and (c) may offer useful, and perhaps more efficient and effective, ways for solving transportation problems than major infrastructure investments. At the very least, it has been realized that a variety of transport actions -- operating as well as capital, immediate as well as long-term -- must be considered in the provision of transportation services in a region.3/

Indeed, the concept of the problem which UTP is intended to solve has changed significantly. Rather than establishing a relatively permanent framework for capital development, UTP is now being approached, in many urban areas, as a process for supporting a variety of ongoing choices about the development and management of transportation systems, including investments in fixed facilities and rolling stock, operating schemes, pricing and marketing, and regulation of private carriers.

The focus on implementing permanent "fixes" for transportation problems has begun to be abandoned, as it has been recognized that meeting some preordained future demand for travel is often fruitless because the associated costs may be unacceptable and because the dynamics of the relationship between transportation and development may never lead to that projected demand. Instead, there has been an increased interest in: (a) monitoring current performance, costs, and impacts; (b) exploring innovative approaches for improving transportation systems, including pricing, use of congestion as a directing force, and creative financing options; and (c) making the most effective use of the interconnexions between transportation and economic activities for providing viable services and guiding development which is both socially desirable and feasible to serve.

In this evolutionary process, UTP has developed an increased orientation toward short-term issues and, concomitantly, has become more salient to the political process and to decision making in the private sector. Long-range planning is not forgotten, but is seen as a backdrop to inform short-range, immediate-action decisions, as part of a programme-oriented planning process.4/ In this way, UTP has become more important, more useful, and more tightly integrated into many realms of decision making in a region: information produced in UTP can be, and often is, useful to many actors for a diversity of purposes.

Emerging Principles of Urban Transportation Planning

UTP is becoming a diverse, flexible process focused on supporting the delivery of good transportation services, measured in terms of acceptable performance at an affordable cost with reasonable impacts.5/ Delivery of needed services is becoming the primary concern, with consideration of fixed capital investments, if any, deriving from this. As a consequence, UTP has developed a strong, multimodal orientation; even where the transit share of the travel market is small, evidence indicates that the role of transit in peak periods and in congested markets can be critically important to the efficiency of a region.6/

The temporal orientation of UTP has shifted from the long-term to include, and in many countries, to emphasize, short- and middle-range needs and actions.

Short-range actions focus on system management, getting the most cost-effective service from the existing capital plant through the joint management of both demand and supply. Options include changes in routing and scheduling, pricing, parking and traffic regulation, and traffic management through restrictions on vehicle access to sensitive parts of the region. These represent useful ways to ameliorate problems, which can be implemented relatively quickly, and which can have major impacts on communities and regions.

Middle-range actions permit consideration of more extensive interventions on both the supply and demand sides. These include intermediate level capacity expansions derived from changes in existing facilities, expansions of the vehicle fleet, strategic changes in pricing and market orientation, and modifications in the institutions which deliver transportation services and facilities. They may also involve guiding demand patterns by influencing land development and use, and encouraging changes in work hours to reduce peaking.

Long-range aspects of UTP have become less oriented toward establishing a definitive blueprint for capital development, and more concerned with exploring alternative development futures for the region in general, and the implications for, and of, different transport development patterns. Products of this component of UTP tend to be structured to support middle- and short-range decisions, rather than to guide specific, long-term choices. To a significant degree, long-range UTP has begun to consider the implications of system management and regulatory options as well as capital development projects.7/

UTP in many countries has become an ongoing process, concerned with understanding transport issues, problems, and options, and focused on support for a variety of kinds of decision making. This has required diverse and differentiated products from planners, with differing time frames, issued on a continuing basis.

Agencies engaged in UTP have shifted to become organizational focal points in multiagency, multiactor efforts to implement transport actions, including but not limited to infrastructure development projects. The most effective agencies are those which have chosen to play the role of catalysts, engaging the various actors, public and private, in joint efforts to manage and improve transportation services and systems.8/

Because it is rare that the UTP organization has the power to select and implement projects, the cooperation of other organizations is critical to the success of UTP, broadly defined to include delivery of effective transportation services. Thus, the catalytic role, sharing the development and use of information and building consensus on courses of action, becomes a logical strategy for assuring the success of the UTP process, the UTP agency, and the transportation system itself.9/

From this perspective, the role of the UTP agency becomes more important than the narrower task heretofore defined for the UTP process. The most important product is not a blueprint, not a document to guide the long-term future capital development of the transportation system. Instead it is the organization of information and actors to support the programmatic management of the delivery of transport services and the evolutionary development of the system and its components.

The effectiveness of the agency is dependent upon the facility with which it brings interacting parties, private and public, together to formulate and implement joint choices about transportation management and development. In addition to the organizational and political resources necessary to achieve this, there is a primary requirement for timely, well-focused, and efficiently-delivered information about system performance, cost, and impacts, both at the present time and in the future.

This has led to the notion of "responsive analysis." In the traditional transportation study, the process was well-defined and the products were, basically, the long-range strategy plan and associated reports. In today's transportation planning agency, planners face requests for many different kinds of analyses: short-range forecasts, small-area detailed data or forecasts, analyses of policy proposals such as changes in transit fares, parking prices, or highway tolls; implications of a particular proposed development in a specific area;

or many others. Often these analyses have to be accomplished in weeks or days, instead of the several months or years devoted to long-range plan alternatives.

Thus, analysts in an urban transportation agency have to be prepared to do analysis quickly, in response to a wide range of issues, with a wide range of different analysis tools and data.10/

UTP in Developing Countries

Urban transportation planning in developing countries is following a similar evolutionary path, and for similar reasons.11/ The typical emphasis on long-range, blueprint planning was originally adopted on the presumption that this orientation is required to support infrastructure development, and that it provides the kind of investment framework necessary to attract support from international funding agencies. But the fact that long-range planning is commonly decoupled from decision making has severely limited the useful life of blueprint plans.

Decisions are taken in the short run, generally with the expectation of (at least some) short-run payoffs. Desirably, to the extent that UTP has a long-range component, it needs to serve as an effective strategic framework for short- and middle-range action choices. These choices must logically be considered within the UTP process; they must include management, pricing, marketing, and regulatory options, for it is these types of choices which are made on a frequent basis, and they have a clear influence on the evolution of the transportation system.

Because shorter-range, no- or low-capital actions can have powerful effects on the need for, and value of infrastructure investments, international funding agencies have begun to demand more serious consideration of system management as well as system development.12/

Local action decisions, themselves, are short-range in nature because of the preference of decision makers for incremental actions with a relatively high degree of certainty.13/ The level of uncertainty is particularly high in developing countries, in terms of options, impacts, costs, and financial capabilities, and even the locus and orientation of political power. Decision makers prefer to avoid (explicit) uncertainty, and this is manifested in their tendency to select short-term, incremental actions.14/ Plans which deal only with the long run fail to remain connected to the practical reality of political choice, and both those plans and their creators remain isolated from decision making, lacking credibility — and security — because of this.

Investing scarce monetary resources, skilled personnel, and three to five calendar years in the definition of a short-lived framework plan is difficult to justify. The effort and time required to "gear up" for a one-shot, long-range study is often not warranted by the usefulness of the results. Extensive and expensive data collection efforts consume resources which, given the impact of the process, might justifiably be better used in other ways. Local personnel trained to perform technical tasks often find that, in a developing economy, there are higher valued uses of their time; thus, building and holding together an effective technical team may be especially challenging.

In an environment of relatively rapid change, where important choices must be taken on a continuing basis, and where political power can shift significantly in short time frames, a different kind of decision support is mandated. Extended study efforts which do not produce products until their completion, and whose products may quickly become outdated, lose their political credibility along with their usefulness. Decisions cannot wait for information, and so proceed without it. The value of the traditional, blueprint planning approach to UTP is limited, especially in developing countries.

Thus, a different kind of UTP is evolving in developing countries as well as in developed countries, focused on ongoing support of the sequence of decisions which establish and maintain effective transportation services. Figure 21 summarizes these trends. It is dependent more on appropriate organizational positioning and behaviour than on specific technical methods. It exists, and thrives, on the provision of a variety of services delivered to a variety of clients. It deals in short- as well as long-term choices, management as well as infrastructure development, public and private modes, and passenger and freight movement. It accommodates uncertainty by delivering specific products to support short-run choices, and more general, strategic products to provide flexible, useful long-term guidance for choices.

It is a form of UTP which serves its various markets by providing useful information to them and, in turn, winning the support of those markets through effective service. In this way, it helps assure that regions with limited resources get the most value from them. The support the UTP agency receives in return for meeting a variety of information needs can be political, financial (through fees for services), and substantive (in terms of data provided by other agencies and organizations).

Figure 21. Changing attributes of urban transportation planning

TRADITIONAL UTP	EMERGING UTP
Long-term Perspective (20 ± years)	Long-term Framework Development (20 years) Mid-range System Planning (5-10 years) Short-term Management Planning (3 months-5 years)
Capital Intensive Orientation. (expansion of Network Structure)	Capital Development System Management (maintenance, operations, pricing, regulation, and finance)
Highway Networks Primary	Multimodal
"Point" Estimates of Future Attributes	Scenario Studies Uncertainty Analyses
Unitary Client (Transportation Investment Agency)	Multiple Clients (investment, management, and operating agencies, private and public)
"One Shot" Plan Development	Ongoing Decision Support Programmatic Planning

Closure: Implications for Information System

The traditional UTP had a style of information support which reflected its preoccupations. Information processing was targeted toward data acquisition and toward plan analysis. Data acquisition required large computer capabilities for processing of large survey files and for calibration of the large regional transportation models. In each study organization, a small number of skilled technicians spend large efforts to get the data cleaned and use it to get calibrated models (e.g., networks, gravity or other distribution models, trip generation models, mode split and assignment models, and related models and processing functions).

Once the data was sufficiently clean and the models sufficiently usable, plan analysis began. Because of the size of the models and of the regional data bases (transportation networks, land use, and population data), development and analysis of each plan alternative generally took significant effort, measured in person-months or person-years. Therefore, there was little inclination to do any more analyses than necessary.

The information systems in the traditional UTP reflected this. Generally, the data base and programmes were designed to be used only by a small number of specialists, and only for the specific purposes of turning out the plan analyses which were required. This was certainly a difficult enough task in itself. When the UTP process began to evolve, the role of information systems had to change. This was a challenge to modify the data files and the programmes and models so that they could be used for a broader range of analyses, under a wider range of conditions. Information systems capabilities had to be evolved to support an environment of "responsive analysis."

TRENDS IN INFORMATION SYSTEMS TECHNOLOGIES

As suggested in the preceding discussions, the development of information systems technology and the evolution of UTP have proceeded in parallel. The technological development has been driven by forces external to UTP and has affected UTP and UTP information systems (more than the converse). Information system technologies have changed in response to significant technological breakthroughs in electronics, and particularly in microelectronics and computers, and in software design and use.

In response to technological advances, some of the constraints on UTP information systems have been relaxed. Parallel changes in the demands of UTP -- the evolution of the UTP process -- have subsequently led to changes in the supporting information systems. Today, the variety of information systems used in UTP is quite large, reflecting the even greater variety in available information systems technologies.

These technologies support the three major UTP information system functions:

(a) Acquisition -- the initial collection and processing of data;

(b) Maintenance -- the periodic updating and revision of data;

(c) Delivery -- the provision of data, raw and processed, to those who desire to use it.

Trends in Information Acquisition and Maintenance

The earliest concern in UTP information system evolution was with data acquisition, the collection and initial processing of data sets. The traditional approach has, until recently, focused on collecting large and complex data sets describing travel patterns, activity systems, and the transportation system. The largest and most costly component of such primary data sets has been origin-destination data describing trips, flows, and travelers, usually collected through large-sample home interview surveys.

Until recently, it was generally accepted that a major UTP study could not be undertaken without a recent, local origin-destination survey. Collection, processing, and analysis of this large data set dominated the activities of UTP, and often consumed 25-40 per cent of the study resources as shown in table 8.5. The role of technology was primarily one of support -- as data processing capabilities advanced from mechanical desk calculators and paper storage to mainframe computers, punched cards, and magnetic tapes, it became possible to handle ever larger data sets in disproportionately less time.

This freedom derived from technological improvements intensified the focus of UTP on the management of large data sets, leading sequentially to more complex models of extremely large and detailed networks; to an expanded understanding of the behavioural phenomena underlying urban travel and related activities; and ultimately to the development of theory, models, and procedures which increased the sophistication of planning and analysis while decreasing the data requirements.15/

TABLE 8.5. COMPARATIVE COSTS OF COLLECTING "BASIC" PRIMARY DATA IN FIVE TRANSPORTATION STUDIES

STUDY	PER CAPITA COST OF DATA COLLECTION (US$)	TOTAL STUDY COST FOR DATA COLLECTION (%)
Buffalo	0.43	36
Chicago	0.22	28
Milwaukee	0.36	30
Tucson	0.86	38
Wilmington	0.73	25
Average (unweighted)	0.52	31

Source: Hamburg Creighton Inc., Data Requirements for Metropolitan Transportation Planning (NCRHP report; 120) (Washington, D.C.: National Cooperative Highway Research Program, National Academy of Sciences, 1971).

URBAN TRANSPORTATION PLANNING INFORMATION SYSTEMS

Today, particularly in developing countries, the emphasis in UTP information systems, has shifted to the maintenance function. This is largely due to the maturity of UTP itself, and to the fact that at least some significant data collection activity has already taken place in many cities (in the U.S., in all cities with populations of 50,000 or more). Developments in "soft" technologies, particularly sophisticated, small-scale sampling techniques, have made it possible to maintain the timeliness of data sets at relatively low cost (small samples).

In addition, compatible coding schemes based on common geographic coordinate systems (geocoding) have made it possible to integrate data sets from several sources, so that one functional area (e.g., UTP) could benefit from investments in fresh data sets made in another (e.g., the periodic national census). In general, the establishment of common Geographic Base Files (GBFs) for data coding for census and other purposes as well as transportation has made it possible to share data more broadly, to bring together related data items (and thus increase their value beyond that of the individual data elements), and to bring about the potential for important cost savings in data collection and maintenance activities across agencies and sectors.16/

> Geocoding systems are information processing tools that allow geographical identification codes (geocodes) to be applied to data files and also allow data to be accessed and displayed in terms of geographic units....17/

The Geographic Base File/Dual Independent Map Encoding (GBF/DIME) system is one type of geocoding system in wide use. It is comprised of four main elements:

> Data Files: Computer-readable files "containing data in which address or geographical location is a significant element."
>
> Base Files: Computer-readable file(s) that "defines relevant geographic units, the locations included in the units, and how they should be coded."
>
> Matching programmes: Computer routine(s) "for matching addresses in data files with geographic units and tagging the data items with the geographic information."
>
> Display programmes: Computer routines for "displaying the tagged data in a form(s) to the analyst."18/

Once the basic effort has been expended to develop a geocoding system in a particular urban area, the development of transportation systems data is greatly improved and significant efficiencies are obtained for the use of that data not only for transportation, but also for a wide variety of other purposes. Since the transportation-required data includes almost all major types of population and other planning data, the geocoding of those data sets makes them also a very much more usable resource for many nontransportation purposes. This is important because the geocoding process not only places all data on a consistent reference basis (the geographic codes), but also inevitably involves cleaning up most incompatibilities among data files in order to assemble a complete, consistent picture of the urban area for transportation modelling purposes.

Data updating has been facilitated by the use of random digit dialing and advanced telephone interviewing techniques, sometimes supplemented with "on-the-ground" checks to validate samples and unobtrusive measures to verify reported behaviour. These methods, along with small-sample design techniques, make it possible to update large data bases at relatively low cost.19/

More recently, the microelectronics revolution has brought to the market hand-held data collection devices and computer terminals, which can be taken into the field for direct data input, used to store relatively large volumes of data (e.g., 64,000 + bytes) and then downloaded into larger computers for editing, processing, and storage. The result is a capability to move from field data collection to data base availability in days or weeks rather than months or years. The savings in manpower which can be derived from such technologies rivals the value of the savings in turn-around time, a measure of data freshness.

Monitoring the overall pace and spatial trends of development has been advanced through the use of the Geographic Base File systems mentioned earlier, where, if accurate records are maintained, building and occupancy permit files can be used to maintain a running record of changes in economic activities. Appropriately-coded utility records can serve a similar purpose, as well as providing a sampling frame for update sampling, in communities where utility connexions are ubiquitous.

More aggregate measures of development of economic activities, infrastructure, and population, are beginning to be derived through the use of remote sensing. Wide- and narrow-band satellite sensors can provide the freshest, and perhaps lowest-cost, data, but only at aggregate levels. Aerial photography is more costly but a more precise technology, which in some cases has been used to assess infrastructure conditions and socioeconomic characteristics.20/

Trends in Information Services Delivery

The delivery function of UTP information systems has not, until recently, benefited much from technological development. This was not an issue when UTP information was viewed as a product for UTP agencies only: delivery was an internal activity, and could be accomplished on computer tapes or through fixed types of paper products.

But with the evolution of a more responsive UTP process, one which serves more clients on more issues, fixed report structures and rigid analysis approaches declined in importance. A stronger orientation toward responsive analysis and toward broader markets, both inside and outside the UTP agency, demands greater variety and flexibility in delivery products, formats, media, and timing.

Technologies have advanced to the point where they can provide strong support in such environments. As discussed below, interactive computing, distributed processing, and end-user computing provide the UTP information system with the capability to respond to users, and the opportunity for users to develop their own products. The movement of the computing resource from the locked doors of the UTP agency -- doors to which only programmers held the keys -- to the desks of data users, dramatically changes the future of UTP information systems, and facilitates the evolution of radically new -- and desirable -- approaches to the information system function.

The delivery function seems to be of primary importance today, especially in developing countries. For the reasons outlined in the preceding section, it is important to serve a wide variety of clients with a wide variety of products: to meet the information needs of many public and private organizations, to build political and financial support, to provide enough scale to justify and attract skilled personnel, and to warrant the concentration of scarce financial and technical resources in this activity. It is especially useful to examine the delivery function in the light of the many opportunities provided by today's rich variety of information systems technologies.

The Range of Information Systems Technologies

Today, information systems technologies provide a rich variety of choices for the development and the offering of urban transportation information systems services and products. Table 8.6 lists the major types of technology components which are potentially applicable. This list includes the choice of hardware and communications, but also includes software and user-support strategies, as these are very important dimensions of technology as well.

To illustrate, let us examine a few of the possible choices:

(a) Traditional Mainframe System: Data bases are processed and maintained in a mainframe system, with batch processing at a single site. Jobs need to be entered physically at this site. Any request for data requires use of prepackaged software, that is, specially written programmes by trained programmers for one-time processing of the data to produce the desired reports. In this case, the user is passive, and simply formulates a data processing request to the management information systems (MIS) department. In this kind of environment, making available a particular urban transportation data set requires development of special programmes to produce either printed reports or data files on magnetic tape to be processed by a user to produce customized reports.

(b) Mainframe or Minicomputer-based Interactive Processing Available Through a Data Base Management System, Decision Support System or similar software: Users with terminals can access the computer to obtain copies of preprogrammed reports, or to generate reports themselves if they know how to use the data base management system. In some cases, the software does not require sophisticated knowledge, but for elaborate and complicated reports expert knowledge of the particular system language is required.

(c) Microcomputer with Specialized Data Sets and User-Application Generating Software: In this case, a data set is provided in a microcomputer environment located at the site of the user, generally at the user's desk. The software is generally easy for an inexperienced user to use, such as a spreadsheet or simple data management system. The user generates analyses and reports as he needs them.

These examples illustrate the broad range of combinations of the items in table 8.6 which are feasible today.

These choices should be seen in terms of the specific functions identified earlier: acquisition, maintenance, and delivery. For example, consider this composite strategy:

(d) Composite strategy: a central mainframe environment is used in batch mode for the initial data collection and processing phase. Once a basic data base is prepared, it is made available in a multiuser interactive environment for updating and for specialized report preparation for some purposes and some users. In addition, subsets of the data base are extracted and made available on magnetic floppy disks for use in personal microcomputers by users in a variety of locations.

TABLE 8.6. MAJOR COMPONENTS OF INFORMATION SYSTEMS TECHNOLOGIES

- Hardware - Mainframe, mini, microcomputers
  - Batch, remote job entry, interactive
  - Controlled environment, uncontrolled

  - Single isolated site, multiple sites
    - Distributed processing, networks

- Communications
  - Hard-wired, telephone, networks + gateways

- Data base
  - Internal, external

- Information system support concepts
  - Transaction processing
  - Management information systems (interactive, predefined, data base)
  - Decision support systems

- Expected role of the user
  - Requires expert support
  - Requires training, consultant support but can use some things alone
  - Does what he wants himself - "end-user computing"

- Software
  - Prepackaged - Either off-the-shelf or built by internal experts
  - User application-generating - data base query language, spreadsheet, application generator language
  - Evolutionary multifunctional environment

- End-user support strategy
  - Dominance of MIS department
  - Information centre - multiservice, user-oriented
  - End-user support centre-team - decentralized, functional department support, multiservice

- External user support

The role of microcomputers

The role of microcomputers in this spectrum of technology is particularly important. This technology is particularly promising and relevant, for three reasons: (a) the characteristics of the hardware; (b) the characteristics of the software; and (c) the behavioural impact of microcomputers in general. The key features of microcomputer hardware are indicated in table 8.7. These indicate the tremendous power available for relatively low cost. While the costs and availability of microcomputer hardware and support services will inevitably be less attractive in developing countries than in developed countries, the relative costs and availability by comparison with mainframe and minicomputers will certainly be valid. In addition, given the freedom from the need for a controlled environment (in most conditions) or for skilled maintenance or operating personnel, microcomputers will be attractive in developing countries.

TABLE 8.7. MAJOR HARDWARE FEATURES OF MICROCOMPUTERS

- Processor - speed, size (8-16-32 BIT)
- Memory -
  - Read-only memory (ROM)
  - Random-access memory (RAM): 16k (kilobytes - 100 characters) -640 KB ++

- Secondary storage -
  - Cassette tape
  - Floppy disk - 5 1/4", 3 1/2" - 640 KB - 1.2 Megabytes
  - Hard disk - 5 - 20 -160 megabytes

    (1 page = 250 words = 2500 bytes;
    64 KB = 25 pages;
    1 MB = 400 pages;
    20 MB = 8000 pages)

- Input/output devices -
  - Keyboard
  - Console/screen
  - Printer
  - Tape/disk
  - Modem
  - Light pen
  - Mouse
  - Digital tablet

- Open architecture -
  - Cottage industry
  - Diversity of add-ons, add-ins
  - Specialized products to meet specialized needs

It is important to recognize that the use of microcomputers should be seen in the context of an overall distributed-processing strategy. Eventually, microcomputers will be used both in "stand-alone" mode and as terminals. As terminals, they may be connected permanently or as needed over telephone lines or special lines to various other systems: as terminals to multiuser mainframes, to minicomputers, or even to multi- or single-user microcomputers, and/or in networks to other microcomputers sharing resources such as hard disks, printers, digital plotters, magnetic tape drives, or "gateways" to other machines or networks.

The software used on microcomputers is significantly different in a number of key respects from that available in mini and mainframe environments. This both reflects the nature of micro use by noncomputer professionals, and stimulates that use. Table 8.8 identifies a number of key features of microcomputer software.

Perhaps the most important aspect of microcomputers is that both the hardware and the software features together add up to a unique cultural phenomenon: the impact of microcomputers on people's behaviour, especially in business and public sector organizations. Table 8.9 lists some of the key features of this phenomenon.21/

TABLE 8.8. KEY FEATURES OF MICROCOMPUTER SOFTWARE

- Use by nonprofessionals
- User-friendly
- Visual
- Documentation, tutorials
- Training aids
- Commercial availability
  - Quantity
  - Variety - generic, special-purpose, vertical market
  - Specialized products to meet specialized needs
  - Consumerism phenomenon

- Application-generating capabilities
  - Spreadsheets
  - Data base
  - Graphics
  - Programming languages - Basic, Pascal, others

TABLE 8.9. ASPECTS OF BEHAVIOURAL IMPACT OF MICROCOMPUTERS

The attributes of microcomputers as users perceive them:

- Perform a specific needed function
- Cost - first time, continuing, incremental
- Ease of purchase - retail, avoid internal bureaucracy (generally), complete starter outfits available off-the-shelf
- Software - variety, flexibility, ease of use, ease of learning
- Immediacy of results - with existing capabilities
- Short lead time - to get new capabilities
- Hardware - design, size, weight
- Desktop presence - a personal working tool
- Personal control over use, priorities
- Feedback - positive, negative, challenge
- Privacy in use - opportunities to fail in private
- Data privacy
- Status - keeping up with others

The behavioural impacts:

- User acceptance phenomenon
- Growth industry
- Consumerism
  - Need to buy - something, anything
  - Tremendous variety of product - what to buy, not whether
  - Aftermarket - software, add-ons/ins, books, magazines, training, "Gadgets"
  - The culture of shopping - browsing, shows
- Business culture

A number of features of microcomputers are especially relevant in developing countries:

(a) no need for a controlled environment, can operate in reasonable office environments;

(b) require only basic skills for operation of hardware, and only knowledge of a particular software package for use by a user;

(c) relatively low price (U.S.$3,000-5,000) means the ability to provide computer support for a diverse group of users economically.

Among the key limitations of microcomputers are:

(a) vulnerability to theft because of size, portability;

(b) skilled personnel are still required for major equipment maintenance, although most vulnerable components are field-replaceable units, and for specialized major software development;

(c) memory size and processing speed, and secondary storage capacity limits (floppy disks, hard disks), do mean that for some types of large-scale computation-intensive processing tasks, microcomputers are not effective or efficient (on the other hand, some processing tasks can be set up to run for days at a time if necessary).

The microcomputer is, as tables 8.6-8.8 suggest, a very important broadening of the technologies potentially available for delivering information systems services.22/ It is especially effective at getting people to use data and analysis tools, particularly those who were not previously oriented in this direction. Most important in this respect is the nature of the software.

While microcomputers are very effective, especially for delivery of information services, it is quite likely in many situations that a mainframe or minicomputer will still be required for the initial data acquisition tasks and for some aspects of data maintenance, as is the composite strategy (d), described above.

User-generated applications

Perhaps the most important aspect of the changes in information systems technologies is not in the hardware but in the nature of the software and the changing role of the user.

As suggested in table 8.6, the "expected role of the user" and the "end-user support strategy" are two key dimensions of this evolution — or perhaps revolution. These are reflected by the role of new types of software.

In the traditional data processing environment which has been common for the last thirty years in transportation and other organizations, the user utilized "prepackaged" software, such as the urban transportation model system (UTMS) packages or census data processing packages. In general, these programmes were developed by programmers and run by programmers or by people who were trained specially and extensively to use these tools. In general, the transportation planner or the policy analyst faced a barrier of people and techniques between him and the exercise of the computer. As a result, only the largest, most structured tasks were actually done through computer processing; urgent policy questions, or exploratory browsing of data, often had to be done by hand or by getting programmers to write special-purpose programmes of limited general value.

In contrast, in both the mainframe and the microcomputer environments, there has evolved a philosophy of "end-user" computing: the concept that the user should be able to specify his own information needs in terms that can be processed directly by a computer package to produce the desired results without need for expert programmer assistance. This is made possible by software which we call "user-application-generating" software. For example:23/

(a) a data base query language allows a user to formulate requests for reports from a large data base;

(b) a financial modelling language allows construction of budgets, forecasts, etc., by a user;

(c) spreadsheet software allows construction of a variety of analyses -- financial, planning, engineering, demographic, etc. -- by a user with a day's training or less.

As a consequence, the expected role of the user shifts from almost exclusive dependence on expert support, to some applications for which the use may require only training and initial consultant support, to many applications in which the user can do what he wants himself. As a result, the nature of technical support to end-users shifts from a mode in which the data processing or management information systems departments are constraints and bottlenecks, to a mode in which there are a variety of forms of user support requiring a mix of technical staff skills and a mix of levels of training and experience.

The effective "information centre" may thus provide a range of training, consultant, and special programming services for end-users, in addition to having available a range of hardware and software to meet different application needs. In addition, specific teams may provide direct support to end-users, often decentralized to functional departments (e.g., a planner can often be the source of internal expertise in certain programmes to others in his planning department).

The variety of application which may be developed is illustrated by a recent compendium of microcomputer software for transportation.24/

Information System Technologies in Developing Countries

The previous section has described the evolution of information system technologies useful for UTP in developed countries. How relevant is this history for developing countries? It is strongly relevant, because it seems both feasible and advantageous for UTP agencies in developing countries to advance rapidly up this learning curve, moving to advanced technologies, and thus to advanced UTP information system management concepts, without moving through the early stages experienced in developed countries.

It is feasible to do this, because many of the advanced information system technologies are cheaper, and simpler, than earlier technologies. This is particularly true for such concepts as micro- and minicomputers, miniaturized data collection terminals, modern mass storage devices, remote sensing methods, and geocoding systems.

It is advantageous to do this, because such technologies produce useful data more quickly, and at lower manpower cost, than traditional approaches. Rapid data availability is important to assure data freshness, particularly in rapidly changing contexts; it also helps to assure support for UTP by leading to useful decision support without delays of months or years. Minimizing skilled manpower requirements is especially critical where trained personnel are scarce and in great demand, a common condition in developing countries.

Specifically, it is feasible to engage in state of the art UTP without large-scale, resource-intensive data collection efforts. One need not, in an era where small sample strategies are well-developed, begin with a large-sample home interview study. Instead, small, targeted samples may be collected, using advanced techniques, to support specific kinds of urban transportation decisions. Through the effective use of geocoding systems, subsequent UTP data samples, and data from a variety of other sources, can be integrated to establish a meaningful and broadly-focused data base.

Through a "bootstrapping" process, each new data element, and each data update, can be added to an expanding data base. In this way, the data resources available for UTP and other activities can be collected, maintained, and delivered, rapidly, efficiently, and effectively.

Small computers, with advanced mass storage capabilities, can support much, if not, all of the data processing and analysis requirements. Such computers can support users with relatively low computer skill levels, compared with the programmer demands of mainframes. Their purchase costs are relatively low, and their user-support features facilitate a strong market orientation by allowing users a considerable degree of freedom to access, analyse, and report data.

Developments in microcomputer technology seem particularly promising for developing countries. Training end-users to do their own computing, given the nature of today's software and hardware, enables effective use of limited technical personnel. Delivery of information services can build heavily on microcomputers and user-generated applications -- once a data base is available, portions of it can be extracted and packaged together with appropriate software in either mainframe or microcomputer environments for end-users to work with themselves. For example, sets of demographic and economic data can be extracted from a regional data set and packaged for use by planners in local governments or by market research and strategic planners in private firms. Microcomputers can be placed in many different agencies, allowing each to make use of UTP-collected data relevant to its own mission.

Closure

Thus, a variety of technological developments in information management, including new ways to acquire, maintain, and deliver information, have led to changes in UTP information systems. In the future, continuing technological development promises to make available greatly enhanced opportunities for UTP information strategies, leading to the possibility of significantly different definitions of, and approaches to, the information system problem in UTP.

THE MARKET-ORIENTED UTP INFORMATION SERVICE

The Coalescence of Forces Affecting UTP Information Systems

It has been shown that urban transportation planning is becoming more concerned with supporting decisions, and therefore, different kinds of analyses, and different data, are required. In particular, this emerging model of urban transportation planning demands a new concept of information support, which responds to:

1. short-range, as well as long-range issues;
2. operations, management, and marketing concerns as well as infrastructure investment options;
3. demand management options, including directions of economic development, as well as the provision of increased capacity;
4. the effective guidance of a variety of decisions affecting — and affected by — transportation, made by a variety of actors.

The previous section examined some of the emerging directions of innovation in information systems technology. The key conclusions from this review are:

1. with respect to data acquisition systems, new technologies which are particularly important include:
    (a) the use of sampling and survey methods designed for efficient use of small samples, which make feasible periodic small-scale surveys for specialized uses and for updating;
    (b) the use of geocoding of data, particularly to street addresses, which provides a basic reference format for storing and updating data and also for interfacing with graphics and other coordinate-based systems;
    (c) field data collection using hand-held devices with microcomputer technologies, which provide efficient means for field data collection under a variety of circumstances and which allow automation or elimination of major parts of the data coding and editing steps.
2. with respect to information delivery systems, important new technologies include:
    (a) microcomputers, which make access to data in a computer environment accessible to many more potential users;
    (b) software designed to support end-user computing, such as data base management systems, application-generating packages, spreadsheets, and

others, which make available to users without programming knowledge the ability to use data in highly individualized analyses and reports;

(c) the ability to package information products in a variety of ways, making the same data sets available to different groups of users with very different needs for manipulating the data or simply using it as is.

The entity evolving to provide this rich menu of information support is called the Urban Transportation Information Systems Utility — UTISU.

Goals for the Urban Transportation Information Systems Utility

The primary goal of the UTISU is to serve a variety of users. There are many potential users of the data managed by a UTP agency. The primary clients, of course, are likely to be elected and appointed officials principally concerned with making urban transportation investment and management decisions. But many other actors play a role in the development and operation of transportation systems, including regulators, private carrier management, and equipment providers.

The information needs of these actors will not be centred solely, or even primarily, on data elements needed to support transportation facility investments. They will be more concerned with operations, pricing, marketing, and service management. In developing countries, especially those where private carriers provide much public transportation, the depth of carrier management capabilities is likely to be limited. Analysis and use of timely data may be rare, and the availability of such data through public agencies may offer a cost-effective avenue for improving the quality of transportation services in a region. Building a constituency for the UTISU, and for UTP, by serving these clients may thus not stimulate those transportation agents to make their data available to the UTP agency, but it may contribute quite directly to the provision of transport service in the region.

There are other actors outside of the transportation sector who can and do make use of UTP provided information. These include public officials concerned with planning other infrastructure elements such as schools, housing, and hospitals, as well as those responsible for management of the delivery of nontransportation services.25/ Data commonly assembled to support UTP, including current measures and forecasts of population, employment, economic and social activity patterns, as well as passenger and freight flows, are often used in the planning and management of other public facilities and services. The UTP agency which recognizes and serves these markets through the UTISU builds a political constituency which provides support for its activities and evolution.

Furthermore, private sector actors involved in management and financing of economic development, including housing, agriculture, and manufacturing can also make use of similar types of UTP information. This is particularly true when the value of these data is amplified through the provision of appropriate analysis services through the UTISU. Private sector users can be expected to include market researchers in manufacturing and retail businesses and strategic planners for major employers concerned with issues of access to employment markets and logistics and physical distribution.

Provision of data and analysis to private sector clients is an increasingly common operating pattern among UTP agencies in developed countries, where skilled manpower is readily available, but the value of sharing data is seen by both public and private agencies as cost-effective. The evolution of this trend has been slowed where (large) public agencies have focused on fears that the data would be used in ways unsupportive of the aims, explicit and hidden, of the agencies themselves. But others have begun to argue that sharing a common data base promotes unified views on issues, encourages horizontal, substantive dialog between public agencies and such agencies and private entrepreneurs, and increases objectivity in decision making.26/

These "external" actors now often make use of UTP data, since it is often the best, most comprehensive data set available. And, such entities are frequently engaged in functions critical to economic and social development of the region. Thus, providing them with information support is not only politically and ethically desirable, but it is also a way of extending the influencing of the UTP process into other spheres which affect and are affected by it. Providing information support beyond the UTP agency, then, because of the power of information, and the unifying effect of shared data, offers another avenue for guiding development along desirable paths, in this case, paths which lead to more effective and efficient transport services under conditions of resource scarcity. Finally, information users outside of the UTP agency and its primary client group can be a source of political and financial support for the UTISU, if some of their information needs are effectively met by the UTISU. Such broadened support can help establish and maintain a strong UTISU; and a strong, market-oriented UTISU can generate that kind of support.

This concept should clarify the use of the term "information utility" — for the UTISU becomes, under this philosophy, a utility for providing a variety of services to a variety of users. Information in urban transportation is no longer developed and managed as a "private" resource of the UTP agency — to be supported solely by the resources of that agency. Instead, by providing a broader range of services and products, to a variety of users, it becomes a valuable tool for the support of regional planning and development on many fronts and by many actors, including but not by any means limited to transportation infrastructure development.

Meeting the needs of a broader market for UTP information requires a change in style of information management -- collection, analysis, and delivery. The specifications for this change, a shift toward an increased market orientation are discussed below.

The task of the UTISU is to meet decision support needs of a wide variety of users.

In the long term, the credibility and viability of the UTISU will come from meeting user needs in the simplest, clearest, and most cost-effective ways.

A UTISU which successfully meets the needs of its markets — in and beyond urban transportation planning — will encompass a variety of data from several or perhaps many different sources. These data will be stored and managed in compatible formats so that they can be merged, combined, restructured, and analysed in a variety of ways.

Such an information system will be capable of providing many different products, in terms of reports and analyses, to a wide cross section of potential users. It will support the differentiated data needs and analysis styles of those users, through its own pre-structured reports and through the support of user-defined analyses and end-user computing.

By serving the needs of such an extensive market, the UTISU will establish a role for itself which is considerably broader than the traditional role for urban transportation planning data and studies. In this way, the UTISU cannot only become an integral part of policy analysis and decision making in its environment, but it can establish itself as a vital resource which can support many actors -- public and private -- in the systematic planning and management of the evolution of the region in which it functions. Thus, the UTISU can become self-sustaining because of the essential contribution it makes to decision support.

No particular form of institutional arrangement for the UTISU is advocated. In a particular urban area, the existing UTP agency may or may not be the most logical institutional home for the UTISU. Many alternatives exist:

(a) part of the UTP agency;

(b) a separate agency, partially coordinated with the UTP agency (e.g., with some shared members of the board of directors or steering committee);

(c) part of a regional or comprehensive planning agency;

(d) part of general-purpose local government;

(e) an independent nonprofit agency; and

(f) an independent for-profit company.

Of course, one important objective of establishing a UTISU is to increase the financial and political support for comprehensive planning and in particular transportation planning. While this goal might argue for alternatives (a-c), other goals may argue for other alternatives in a particular urban area.

As one example, in the Los Angeles metropolitan area, the Southern California Association of Governments (SCAG) (the UTP agency for the region) has set up an independent not-for-profit agency to provide general-purpose information services. Members of the board of this agency include private citizens and businessmen as well as members of SCAG's own board.

Key Features of the UTISU

The key features of the UTISU derive from the changed nature of the urban transportation planning process, as described earlier:

1. continuous planning process, with an emphasis on:

    (a) programmatic planning - providing data and analyses to answer specific decision issues;

    (b) policy-oriented planning - providing answers to broad policy questions, such as pricing, hours of service, and extent of coverage by transit;

    (c) periodic updates of basic planning documents to reflect changed realities.

2. multiple clients - different organizations and different elected officials at various levels look to the urban transportation planning process to provide them with useful data and analyses, tailored to their specific needs.

3. responsive analysis style, in which:

    (a) a variety of data types and modelling tools are available and used, ranging from very simple (e.g., the use of elasticities to calculate responses to a change in transit or parking prices or fuel taxes), to subarea models, to full urban area detailed network models;

    (b) different types of analyses are done for different issues, ranging from a quick set of calculations using pencil and paper or pocket calculator to answer a question in a few hours, to simple models taking one or two weeks to use, to full-scale network analyses taking one to ten person-years to perform;

    (c) different analysis approaches are used depending on the policy questions being analysed: sometimes an emphasis on travel times and costs, and flow volumes (vehicles and people), other times an emphasis on air quality and traffic noise, or on urban development impacts.

Corresponding to these characteristics of the urban transportation planning process, one can identify the following, similar characteristics of the information systems required to support urban transportation planning:

1. information is collected:

    (a) on a continuing basis;

    (b) from a variety of sources;

2. to be integrated and coordinated:

    (a) on a common, geographically-coded basis;

    (b) to form an integrated data base or bases;

    (c) focused on the transportation system, but

    (d) including a wide range of data types;

3. The resulting resource is then used to provide a variety of information products and services;

4. to a variety of different clients;

5. delivered in a variety of different ways.

These characteristics are discussed below, beginning first with the variety of clients (see table 8.10). This reflects the emphasis on a market-driven strategy.

TABLE 8.10. KEY FEATURES OF THE UTISU

Variety of clients

User participation in the UTISU

Information delivery means

Variety of information sources

Frequent, results-oriented data updates

Variety of financing mechanisms

Market-oriented management approach

Variety of clients

The initial motivation for urban transportation information collection and analysis usually derives from the desire to establish the data base necessary for comprehensive long-range transportation planning. Generally, there is a small number of primary clients: a national, provincial, or regional transportation or public works agency, or a comprehensive planning agency.

In almost every urban area, there are many potential or actual clients who can or want to make use of portions of this data, and other resources which can be supplied. Potential clients would include:

1. Transportation agencies and firms:
    (a) local, county, provincial public works agencies, highway departments, and other facilities-oriented agencies;

  - (b) transit (bus, rail, railroad), paratransit (taxi, jitneys, and others), airlines, trucking companies, port and harbour authorities, and other transportation operating agencies;

2. other public agencies:
   - (a) planning and operating agencies in other functional areas, such as health care, water supply, flood control, housing, education, and social services;
   - (b) general-purpose units of government, such as local governments, county, provincial, and national agencies;

3. private firms and organizations:
   - (a) businesses seeking market information on which to base locational decisions for new facilities or services, or information to be used in developing marketing plans and programmes;
   - (b) nonprofit organizations seeking to target their services more effectively.

User participation in the UTISU

Client involvement in the UTISU can be enhanced, and the effectiveness and efficiency of the UTISU will be increased, to the extent that clients advance from merely being "users" to become participants. This can occur when outside organizations, public or private, contribute data (or access to data) which they may be uniquely equipped to collect. For example, a private bus operator may contribute passenger volume counts, or a health care agency may provide recent community health, demographic, and socioeconomic data. Special access restrictions and aggregation may in some cases be necessary to protect proprietary interests when data are shared.

Client participation can also occur in analysis and forecasting, where groups external to the UTP function have special capabilities or perspectives to bring to the analysis effort. For example, the Washington, D.C. Council of Governments (COG), the UTP agency for that region, meets with local governments every two years to produce revised forecasts of population and employment. The COG provides initial forecasts of regional control totals, utilizing data from a variety of sources. Representatives of regional, county, and local governments then meet to combine their knowledge and data and produce a set of reconciled (internally consistent) forecasts by subareas.

To make multiple-client participation work, cooperative agreements often are adopted, spelling out the opportunities and rights of the various actors, as well as the commonality standards to be placed on data formats, geocoding schemes, and data item definitions. These agreements can include fee structures and waivers for provision of both data and in-kind services.27/

These clients may be interested in many of the types of data typically collected, at various degrees of aggregation, for varying portions of the urban area, and for various time frames: historical, present situation, projected, or planned future conditions (see tables 8.1-8.4).

Information delivery means

As previously discussed, information systems technology today provides the potential for a rich variety of ways in which information services can be "delivered" to clients:

1. media for delivery of data:

   (a) "hard-copy" (in printed form), computer-generated or manually-generated from computer-based data — reports, tables, publications, maps, graphic renderings of data (e.g., population distribution pie chart or histogram);

   (b) on-line access to data stored in computers (generally mainframe or minicompuer, but can also be a microcomputer) — with access via terminals or microcomputers over commercial telephone lines or (for short distances) special cable connexions or local area network technologies;

   (c) machine-readable media, suitable for input to a client's computer installation — magnetic tape, magnetic disks (soft, "floppy" disks such as used with microcomputers, or "hard" disks used with computers of all sizes), bar code printed on paper for reading with an optical bar code reader, optical character reader (OCR) form, and magnetic cards for use in programmable pocket calculators; video tape, video disks, and other media will also shortly be economically feasible;

   (d) complete information systems for use by clients in their own locations, such as:

(i) software packages together with data base(s) for use on specified computers (potentially with update services);

(ii) "turnkey" systems, consisting of computers as well as software and data bases -- e.g., an urban transportation study might provide demographic and economic data for present and projected future conditions to each of the school districts (or other local educational bodies) in its region, together with software and microcomputers, for use in their local education planning responsibilities;

(e) presentation media, suitable for presentation to groups -- slides, slide-tape presentations, video tapes, scripted video, or movie film presentations (e.g., "Your region today and its health problems");

2. other services: provision of supporting services to clients to enable them to use information services effectively, such as:

(a) inquiry services -- direct information search services, to respond to particular queries, providing simple data on request, or alternatively doing more elaborate analyses such as special tabulations;

(b) special surveys -- doing special data collection as well as special processing to produce information tailored primarily to the needs of a specific client (e.g., employment survey of all employers every two or three years to serve the needs of an economics or commerce-oriented ministry or agency as done by Washington, D.C. Council of Governments and other agencies);

(c) training in the use and interpretation of data;

(d) training in the use of software, hardware, and other support tools;

(e) hosting of multiagency task forces producing or editing data -- e.g., where the regional agency produces control totals for current and forecasted population and employment, and then hosts a working conference where each local area representative produces detailed estimates consistent with the control totals and with other local area estimates;

(f) educational series -- presenting data about the past, present, and future of the region in various forums, e.g., to businessmen's groups, to developers, and to health care agencies.

Variety of information sources

The data collected and collated by the urban transportation agency may come from many sources:

1. major cross-sectional data collection activities: including the traditional large-scale home interview survey, land use data, census data, other population and employment data, and transportation and travel data, collected generally under the guidance of the urban transportation agency and for the specific purpose of establishing a single internally-consistent data set in order to develop conventional areawide transportation models:

   (a) initial survey;

   (b) periodic updates;

2. periodic or continuing data collection by transportation operating agencies such as traffic counts, transit ridership surveys, airport user surveys, truck terminal usage surveys, and others.

3. periodic or continuing data collection by other public general-purpose or functional agencies, such as school population surveys, housing condition surveys, land use surveys, and others, done for the area as a whole or on a sample basis for the area or for subareas.

4. periodic or continuing data collection by private firms and organizations, perhaps available free, for a fee, or in exchange for urban transportation agency data, such as: insurers' surveys of buildings and conditions for insurance purposes; household surveys for market research purposes; retail outlet location surveys for new store planning purposes; and others.

As one example of the innovative approaches that can be taken, the Southern California Association of Governments provides a good illustration. SCAG (which serves as the urban transportation planning agency for the region) is also a repository for U.S. census data. For transportation planning purposes, SCAG developed software to produce various kinds of special-purpose small-area reports from the available census data. It now publishes a catalog of various kinds of reports which can be produced on demand, as a mechanism for making this service available to the public as well as to other governmental agencies. As described earlier, SCAG has set up a separate agency to perform these services for clients.

The software has been designed so that administrative personnel in the agency can operate it, thus enabling client requests for special reports to be handled as a routine administrative task by clerical staff, without any requirement for use of skilled programming personnel.

SCAG also produces reports using the transportation portion of the national census, a special sample and data base. In addition, SCAG does contract work for other local agencies to run its transportation models for various purposes.

As a further innovation, SCAG has contracted with its sister organization in Northern California, the Association of Bay Area Governments (ABAG) in the San Francisco Bay region, to provide a similar service. ABAG markets the catalogue of information available for its region to its clients in that region. SCAG provides the catalogue contents for distribution under ABAG's name, and also the support staff and software, and actually processes the report requests received by ABAG.

Frequent, results-oriented data updates

Maintaining the timeliness of the data base will be important to assure its usefulness in decision support. Historically, it has been difficult to justify the costs of large-scale, infrequent, general-purpose update surveys. Technological advances, applied in the context of UTISU, can facilitate maintaining data freshness.

Once a basic data base has been collected, a variety of efficient, small-scale sampling and monitoring techniques can be used to update the data to present conditions and to provide a consistent basis for producing revised forecasts. Special surveys can be designed and implemented using a range of alternative techniques, such as those shown in table 8.11. A key feature of these surveys is that they can be designed to achieve two objectives simultaneously:

(a) provide data needed to address a pressing policy or planning question (sometimes necessary in order to obtain financial support for a survey from a participating agency);

(b) provide data useful in updating some portion of the basic regional data base and/or forecasts.

In developing countries the techniques such as those listed in table 8.11 have different applicability to low-income areas typically occupied by squatters or residents in uncontrolled and shanty housing, as distinct from middle and upper income areas. Mixed survey techniques may well be appropriate, using different techniques with different population groups or geographic areas.

TABLE 8.11. SOME TYPES OF UPDATING SURVEY METHODS

- traffic counts — vehicles, pedestrians
- transit ridership counts
- aerial surveys — changes in land use, population
- samples of construction or other permits (where these are valid sources of data)
- sample counts of buildings, households, population, jobs:
  - interview or visual survey -- sample of selected small geographic areas
  - telephone-based sample (where representative)
  - mail-out sample
  - workplace-base sample (employer information or employees)
- employment data

Variety of financing mechanisms

The preparation and delivery of information services can be financed and priced in a wide range of ways. Various combinations of approaches can be used, including:

1. public finance of all activities of the agency with provision of information services to particular clients at essentially nominal or no cost, as done by national census bureaus in many countries;

2. all agency services required to be self-supporting, covering all costs including those of data collection; private sector and public sector organizations pay specific fees or prices for particular services rendered;

3. various mixed strategies, in which, for example:

   (a) some basic information collection and processing costs, some basic administrative costs, and some research and development costs are financed on a sustained basis by one or several functional agencies with particular programmatic interest in the information services offered (e.g., a ministry of public works and transportation which finances basic transportation data collection and processing);

   (b) most information services provided to public agencies are priced at incremental costs with some or no contribution to allocated basic agency costs;

   (c) most information services provided to businesses and individuals are priced at incremental or fully-allocated costs.

Great imagination can be exercised in developing financing schemes and pricing policies, and in matching these to the organizational relationships. The contractual relationship between two regional bodies in California (SCAG and ABAG), in which one performed services which the other marketed, has been described. On a national basis in the U.S., the National Association of Regional Councils (which includes comprehensive planning and transportation agencies) has organized a consortium of some forty regional agencies to exchange information, expertise, software, and marketing strategies, and to engage in joint national marketing of their data and information products.

Managing an Information System Utility

The UTISU has a rich variety of choices open to it about what clients to seek to serve, with what products delivered through what media, supported by what data collection activities, and what specific research and development activities. These choices are reflected in the triangle shown in figure 22, on the generic market-oriented UTISU.

To manage this process effectively, the UTISU needs to have an explicit management philosophy and pragmatic, client-centred approach. The basic process is shown in figure 23, on managing the market-oriented service delivery process.

A key feature of this process is that an identification of clients' needs for data is a first step. Recognition of clients' needs and desires must be a strong driving force in the management process.28/ Obviously, knowledge of available data and information services also plays an important role. Once various possible needs are identified, they can serve as a basis for developing possible product concepts to meet those needs.

Figure 22. Generic market-oriented UTISU

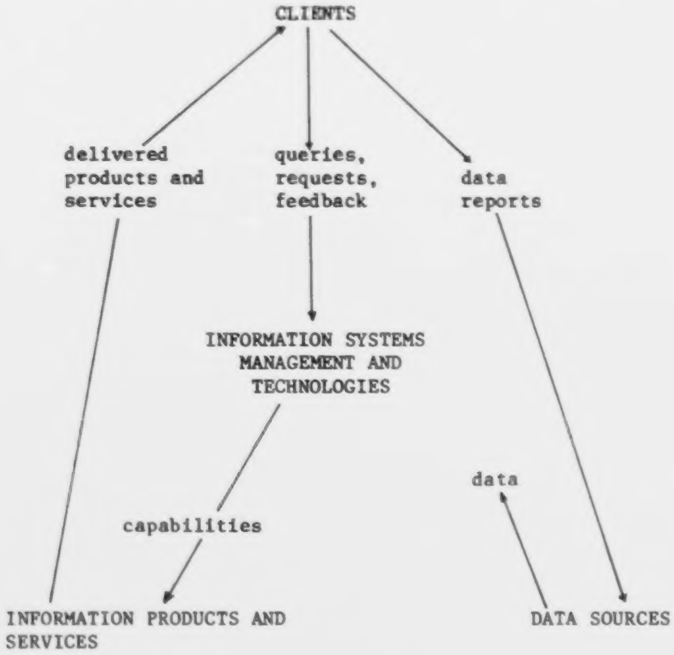
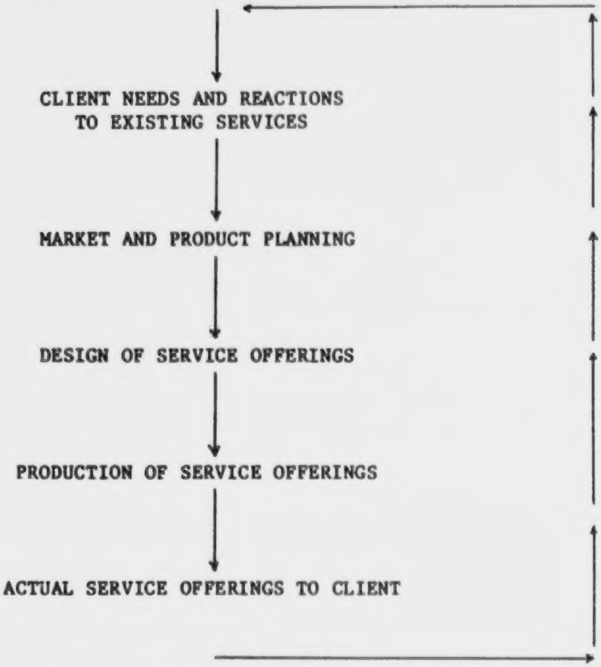

CLIENTS
delivered products and services
queries, requests, feedback
data reports
INFORMATION SYSTEMS MANAGEMENT AND TECHNOLOGIES
data
capabilities
INFORMATION PRODUCTS AND SERVICES
DATA SOURCES

Figure 23. Managing the market-oriented service delivery process


CLIENT NEEDS AND REACTIONS TO EXISTING SERVICES
MARKET AND PRODUCT PLANNING
DESIGN OF SERVICE OFFERINGS
PRODUCTION OF SERVICE OFFERINGS
ACTUAL SERVICE OFFERINGS TO CLIENT

For example, knowing that health care agencies are concerned with capacity utilization and possible expansion of capacity, leads to the identification of a possible product in which previously-developed regional and local forecasts are put into a form appropriate for health care planning (e.g., different disaggregations corresponding to service areas of particular types of facilities).

Further, recognizing that health care agencies vary greatly in the degree of skills in their planning staff, suggests that this type of information might be offered in two forms: printed reports, for reference use by planners in smaller agencies or facilities; and in the form of microcomputer turnkey systems with software and data sets for use by planners in larger agencies. The turnkey systems would allow the planners to vary assumptions and analysis approaches to develop forecasts consistent with their own policy and planning perspectives, for their own institutions or organizations.

Market and product planning involves taking the potential product concept, targeted toward particular clients' needs, and developing specific plans for the product or product line (as in the health care example). These plans would include the basic features of the product(s) and the basic marketing strategies to be followed (e.g., use of direct marketing via mail, and use of advertising in the general press or specialized publications if appropriate for the product).

The next step is detailed design of the service offering. This includes:

1. design of the data to be offered initially;

2. design of the data updating processes to be offered, if any;

3. selection of delivery media and detailed functional specifications (e.g., functional specifications of the software or the data files and preliminary layout of report structures and contents for printed reports);

4. selection of user support strategy, including:

    (a) documentation;

    (b) training;

    (c) workshops and seminars;

    (d) "hot line" technical support — telephone or other direct access to technical problems which the user might encounter;

    (e) nature of consultant support, both for technical advice and to produce special versions of the product on request (e.g., produce a nonstandard magnetic tape containing the data base being marketed).

5. detailed design of the marketing programme;

6. financial plan for the service (e.g., initial development out of the agency's own funds, or by a special grant from another agency, or by a subscription from several businesses interested in using the product);

7. staffing and training plan to produce the product and maintain it, and to support the service offering;

8. product enhancement and product line expansion plan, to be undertaken if the first stage is successful.

Other elements may also be included in the design of the service offering. Alternatively, a much more limited approach may be taken, covering only a few basic elements of this list.

Production of the service offering involves the execution of the various plan components outlined above, including:

1. data collection, processing, and analysis;

2. preparation of reports, files, or other forms of delivery;

3. staff development, training, and various other support activities.

The actual marketing of the product leads to the offering of the service to clients. Clients' uses and reactions to the product are very important inputs to beginning another iteration of the cycle, as well as influencing immediate and effective modification of the product to better tune it to the observed market responses.

This is a general approach, obviously, which is applicable to many types of products and services. In one sense, the basic argument of this paper is that this approach is essential for the future development of urban transportation information systems. No longer can our societies -- especially the large urbanized areas in developing countries -- afford to let the technology of urban transportation information systems drive the process. Rather, the technologies of data collection and processing provide potential opportunities, but one must select carefully among these opportunities in choosing which urban transportation information actions to undertake. For one set of clients, it may be attractive to collect the complete area-wide transportation and planning data which was the traditional single function of the urban transportation study organization. But these resources may be more effectively deployed in a mix of activities, targeted toward a broader range of clients.

The Connexion between UTP and UTISU

It is logical, at this point to examine why the UTISU concept should emerge from the UTP function. One might argue, for example, that it might equally well be based in a regional development planning process. There are several reasons why, in many situations, the UTP agency is the most appropriate source to initiate the UTISU.

(a) From its inception, UTP has been strongly (perhaps too strongly) focused on data collection, analysis, and management. Thus a tradition, and more importantly, professional skills for advanced information management, reside in the UTP process.

(b) UTP even in its emerging form is dependent on a variety of data (see, for example, tables 8.1-8.4). These UTP data are gathered from a variety of sources, e.g., national census, land use surveys, economic studies, travel surveys (see tables 8.2-8.5). The UTP process establishes an internally-consistent, comprehensive, and quantitative picture of the region by pooling these data sources. This data resource can be made widely available through the UTISU.

(c) UTP is also dependent on relatively disaggregate data coded in spatially-defined terms. With an appropriate and consistent geocoding system, it becomes possible to match and merge diverse data sets, and to aggregate data to a variety of spatial zone systems.

For example, data coding may be accomplished through the use of a Geographic Base File using the Dual Independent Map Encoding technique, in which street addresses are related to specific street segments, and the data base is organized with the street segments as the basic unit of record. This supports recording of data at the most disaggregate level (street address or equivalent), from which a wide range of data aggregations can be performed — to national census blocks and tracts, to traffic zones, and to health planning districts, flood control districts, and political jurisdictions at the local, county, and state/provincial levels.29/ Once this has been done, either for census or for transportation purposes, this GBF then becomes a basic reference framework for future data collection and delivery activities.

Thus, UTP requires essential methodological and data resources which can effectively form the core of the UTISU. It seems, therefore, to be a logical host for this new entity.

Closure

The concept of the UTISU is basically simple: build on the basic strengths of the staff, tools, and data established to support the traditional UTP, to develop a market-driven information systems utility. This utility should be market-driven, serving a wide variety of clients, and delivering information services to these clients through a wide variety of means. This strategy offers the best potential to ensure that:

(a) data is collected in a timely fashion, and kept current;

(b) data is collected that is relevant and is used by clients, whether public sector or private sector;

(c) resources are obtained that are sufficient to support significant staff expertise and sufficient data collection and analysis tools; and

(d) the objectives of improving planning in general, and transportation planning and decision making in particular, are best met.

The concept of the UTISU represents a significant shift from a technology-driven orientation to urban transportation information systems (previously driven by the technology of the planning process) to a market-driven orientation which will result in significantly greater impact and effectiveness.

CONCLUSION AND RECOMMENDATIONS

Our review of the evolution of urban transportation planning, information systems technologies, and the problems and opportunities of information system in developing countries has led us to one fundamental conclusion:

> In order to be more effective and less vulnerable, urban transportation information systems should be seen as a catalyst to the creation of a multiproduct, multiclient information service, the Urban Transportation Information Systems Utility. This service may be a unit of an urban transportation planning or operating agency, or of a parent agency, or may be a part of a regional planning agency or of general-purpose government, or may be an independent nonprofit organization. It may be required to cover all costs out of revenues, or only a portion. Regardless of the specific organizational form which is taken in a particular area, the functions to be provided will be similar.

In some urban areas in some countries, there will be explicit decisions to develop a UTISU-type organization; in others, it will tend to evolve anyway. To assist in understanding and evaluating these trends, we suggest the following actions to be undertaken by the United Nations Centre for Regional Development as a part of its overall programme of research and information exchange:

(a) monitor what selected agencies are doing and solicit brief news-type case studies and disseminate them through an appropriate publications medium (e.g., newsletter);

(b) select a small number of "pilot" or prototype agencies to be monitored in depth; provide technical assistance if feasible;

(c) stimulate regional meetings annually or semiannually to serve as working environments for exchange of information on technical and organizational approaches, especially:

  (i) types of products offered;

  (ii) information acquisition strategies and problems; and

  (iii) fees and other aspects of service offerings.

(d) stimulate the exchange of information, including software, among agencies in various countries to increase effectiveness and lower costs;

(e) establish an information network to put people in touch with peers who may be able to assist them: assemble an information file with names and addresses; cross-referenced by information on what they are doing;

(f) conduct research to identify practical advantages and disadvantages, and problems encountered, with the concepts identified here;

(g) establish a specialized library on the subject; and

(h) establish linkages with functional agencies in other sectors in various countries.

NOTES

1/ Hamburg Creighton, Inc., Data Requirements for Metropolitan Transportation Planning (NCRHP report; 120) (Washington, D.C.: National Cooperative Highway Research Program, National Academy of Sciences, 1971).

2/ See for example, R. H. Binder, "Major Issues in Travel Demand Forecasting" in Daniel Brand and Marvin L. Manheim, eds., Urban Travel Demand Forecasting and Air Quality Planning (Washington, D.C.: U. S. Environmental Protection Agency, 1973); R. J. Bouchard, "Relevance of Planning Techniques to Decision-Making" in Brand and Manheim, eds., Urban Travel Demand Forecasting and Air Quality Planning; Brand and Manheim, eds., Urban Travel Demand Forecasting and Air Quality Planning; Ralph Gakenheimer, The Automobile and the Environment: An International Perspective (Cambridge, MA: MIT Press, 1978); and Marvin L. Manheim, Fundamentals of Transportation Systems Analysis (v.1) (Cambridge, MA: MIT Press, 1979).

3/ See for example, Robert A. Burco, "Urban Public Transport: Service Innovations in Operations, Planning and Technology" in Gakenheimer, ed., The Automobile and the Environment; Marvin L. Manheim, "Principles of Transportation Systems Analysis" (Highway research record; 180) (Washington, D.C.: Transportation Research Board, 1966); and Organisation for Economic Co-operation and Development, The Urban Transportation Planning Process: In Search of Improved Strategy (Paris, 1969).

4/ Manheim (1981).

5/ Marvin L. Manheim et al., Transportation Decision-Making: A Guide to Social and Environmental Considerations (NCHRP report; no. 156) (Washington, D.C.: Transportation Research Board, 1975).

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7/ Manheim (1981); and Schofer (1983).

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9/ R. H. Bradley and E. M. Casebeer, "A New Role for Transportation System Managers" (Proceedings of the World Conference of Transportation Research, London, 1980).

10/ Marvin L. Manheim and John H. Suhrbier, "The Automobile and the Environment: Implications for the Planning Process" in Gakenheimer, The Automobile and the Environment; and Marvin L. Manheim, "Recent Developments in Urban

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PART II

Asian and Pacific Perspectives

Chapter 9

INFORMATION SYSTEM FOR REGIONAL PLANNING IN MALAYSIA: THE CASE OF KEVIS IN KELANG VALLEY

Johari bin Mat

INTRODUCTION

Objectives and Scope of Study

This study examines the Kelang Valley Information System (KEVIS) as an example of a data bank and urban information system which was established to facilitate regional development planning, monitoring, and coordination. Created in 1983, KEVIS is the first of its kind in Malaysia. The full installation and configuration of the system and subsystem have not been completed, and it is anticipated that data collection, compilation, storage, and systems development can only be finished by 1986.

The objectives of this study are: (a) to survey the sources and types of information available for national and regional development planning in Malaysia; (b) to examine the background, rationale, and process of the establishment of KEVIS; (c) to understand the concepts, proposed systems design and configuration, subsystems components, data input and output, and management organization of KEVIS; and (d) to evaluate the positive and negative experiences of KEVIS as an information system for regional planning.

In terms of scope and limitation, the study is specifically focused on the information system created to meet the needs and concerns of the Kelang Valley, and not on a national system for other regions or for the country as a whole. Besides being a dedicated information system, KEVIS is also a system that is created by and for the Government, specifically the Prime Minister's Department, for planning and administrative purposes. Many of KEVIS component subsystems are new in terms of data and computer systems design. Because of the above factors, the study of KEVIS has been interesting as well as challenging. It is also a study of a system that is currently being implemented, experimented, and redeveloped to cope with new data and planning needs. It is a learning system that also hopes to learn from other experiences and systems elsewhere in the world.

INFORMATION SOURCES FOR REGIONAL PLANNING

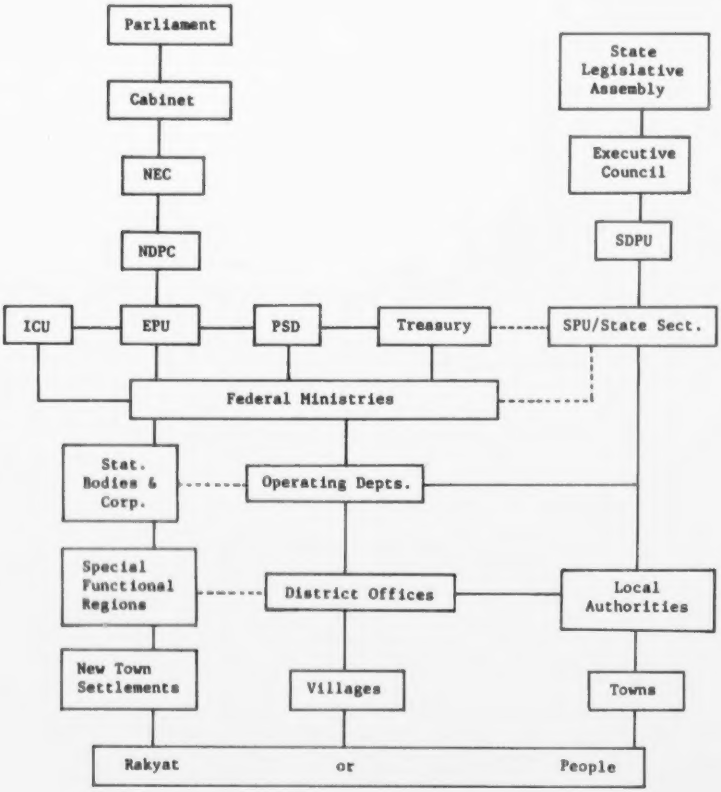
Levels of Development Planning and Implementation

Development planning in Malaysia is undertaken at three important levels, namely, the federal, state, and ministerial levels. Planning at the federal government level is the overall responsibility of the Economic Planning Unit (EPU) in the Prime Minister's Department, but with the support of, and in coordination with the Treasury and the Public Services Department (PSD) for financial and manpower needs, respectively. Planning at the state level is coordinated by the State Economic Planning Unit (SEPU), which is an agency within the State Secretary's office. Planning is also carried out by the Research and Planning Divisions of the federal ministries, which are often concerned with the preparation of policy papers and annual and five-year development plans.

Figure 24 describes the levels and processes of development planning that are carried out by federal and state agencies every year for annual plans and budgets, every five years for national development plans, and every two-and-a-half years for mid-term reviews of the five-year development plans. These planning processes are officially integrated through the various State Planning Committees (SPC), the National Development Planning Council (NDPC), the National Economic Council (NEC), and the Cabinet before they are approved as state and national plans by the State Legislative Assemblies and the Federal Parliament.

Since Malaysia adopts a federal system of government, two parallel hierarchies of planning functions are observed. At the state level, the lowest planning entity is the village (kampung) and the municipality. The Village Development and Security Committee (Jawatankuasa Kemajuan dan Keselamatan Kampung) (JKKK) and the Municipal/District Councils (Majlis Perbandaran/Majlis Daerah) are two types of grass roots planning institutions. After projects have been identified at these levels, the requests are transmitted to the District Development Committees. The Committees are chaired by the local district officers and committee meetings are attended by heads of agencies, assemblymen, and parliamentarians of the district. The proposed projects are discussed, rationalized, and integrated into the draft District Development Plan before being submitted to the State Economic Planning Unit for further rationalization and integration as the draft State Development

Figure 24. Development planning and implementation levels and linkages


Parliament
Cabinet
NEC
NDPC
State Legislative Assembly
Executive Council
SDPU
ICU
EPU
PSD
Treasury
SPU/State Sect.
Federal Ministries
Stat. Bodies & Corp.
Operating Depts.
Special Functional Regions
District Offices
Local Authorities
New Town Settlements
Villages
Towns
Rakyat or People

Acronym Key:
NEC : National Economic Council
NDPC : National Development Planning Council
SDPC : State Development Planning Committee
EPU : Economic Planning Unit
SPU : State Planning Unit
PSD : Public Services Department
ICU : Implementation Coordination Unit

Plan. The SEPU will present the proposed plans to the State Planning Committee and the State Executive Council for debate and decision, respectively, and later on to the State Legislative Assembly for legal approval and budgeting.

The Federal Government also utilizes the same village and district level institutions to identify and propose development projects to be financed and implemented by federal agencies. Normally at the district level, two types of projects are identified, namely, state and federal projects. Projects become federal projects because their size and complexity make them beyond the financial and technical capability of states to implement. Other projects, such as health services, education, and security are automatically federal projects because they are by definition of the Federal Constitution federal responsibilities. The federal projects are identified by the sectoral ministries and are subsequently submitted to the Economic Planning Unit for inclusion in the national development plan, to the Treasury for funding, and to the Public Services Department for manpower allocation. The National Development Planning Council and the National Economic Council will scrutinize and check all plan proposals before they are presented to the Cabinet and Parliament for approval and legislation.

Data and Information Sources for Planning

As had been described, planning involves numerous agencies, authorities, levels, and processes. It ranges from national planning by the EPU in the Prime Minister's Department, to sectoral and regional planning by ministries and states, and to regional and local planning by states and districts. In all these instances and levels of planning, data and information are critical and necessary prerequisites. Data and information necessary for effective planning exist in many agencies in incomplete, disintegrated, and diversified forms. Some necessary data have also not been identified, collected, or compiled yet. There are also cases where data were expensively collected for purposes relevant before but not necessarily relevant now.

Nearly all governmental and nongovernmental agencies which undertake planning, implementation, or administration of projects and services collect, compile, store, analyse, and publish data and information of various kinds. All big central agencies, ministries, and some specialized agencies and corporations collect, analyse, and produce data. Some academic and research institutions also collect and produce data and information. It is impossible nor necessary to list all the institutions and bodies which collect and produce data for planning. It is perceived that it will be sufficient to just identify the major institutions and agencies which collect and produce important data. This will be enough to illustrate the diversity, duplicity, and variation of quality of information for national and regional planning.

One single and most important agency which collects, compiles, analyses, and supplies information for planning and administration is the Department of Statistics. The Department of Statistics was established in 1949 with the following objectives:1/

(a) to collect, compile, and analyse data required for the implementation of the New Economic Policy, with special emphasis on statistics relating to income distribution, ownership and control in the corporate sector, ownership of fixed assets and employment structure in the corporate and noncorporate sectors, structure and distribution of labour force, and employment and unemployment;

(b) to collect, compile, and analyse data required for overall macroeconomic planning. A vast range of economic and socioeconomic statistics covering areas such as population, national accounts, balance of payments, production, trade, prices, agriculture, labour force, employment and unemployment as required for this purpose;

(c) to advise and assist various ministries and agencies in the compilation of special statistics required in the formulation of specific policies and programmes (participation in committees, joint projects, technical advice, and providing core of professional staff to ministries and agencies); and

(d) to provide data processing facilities to other government agencies which do not have such facilities (e.g., Election Commission, Immigration Department, Tourist Development Corporation, and Ministry of Labour and Manpower).

The Department of Statistics is organized into various divisions to facilitate production of statistics on specific topics, namely: Agriculture Survey Division, Demography and Population Census Division, Household and Labour Statistics Division, Price and Income Division, National Accounts Division, Trade Division, Industries Division, and Analysis Division.

Many types of statistics are produced, but generally they can be classified into the following classes of information according to methods of collection:

(a) Mailed questionnaire surveys — covering establishments and enterprises such as rubber, oil palm, tea, coconut, and cocoa estates, produce brokers, rubber licenses, manufacturing, construction, mining, quarry, wholesale and retail trades, professional, institutional, and service establishments (financial, insurance, transport, entertainment, tourism, and real estate).

(b) Household survey — utilizing the field interview method (e.g., population and housing census, agricultural census, household expenditure survey, and labour force survey).

(c) Survey utilizing direct method of physical observation and measurement (e.g., padi production and crop-cutting surveys).

(d) Derived statistics (e.g., national accounts, balance of payments, consumer price indices, producers price indices, indices of industrial production, import and export volumes and unit value indices).

(e) Statistics compiled from documents supplied by other government ministries and departments (e.g., trade statistics from Customs Declaration of the Customs Department, visitors' arrival statistics from embarkation and disembarkation cards of the Immigration Department, vital statistics from birth and death certificates of the National Registration Department, government accounts statistics from the financial statements of federal, state, and local governments and statutory bodies).

(f) Statistics obtained as by-product of the administrative and regulatory processes and supplied by other government departments (e.g., number of teacher/pupil ratio, road mileage, number of TV licenses issued, number of motor vehicles registered, number of hospitals, clinics, doctors, and nurses).

Other ministries and agencies also collect, compile, analyse, and sometimes publish information for specific ministerial or departmental purposes and responsibilities. Nearly all ministries and large departments have their own Research and Planning Divisions or Sections with specific responsibilities to conduct surveys, compile and analyse data, prepare policy papers, and draft ministerial and departmental plans. As a brief illustration, the following are some of the important data collected and kept by selected ministries:

Ministry of Housing — list of developers, list of housing projects, number of housing units x projects, number of units approved x types, number of units sold x type x costs per unit, number of units sold x type x selling price range, and proposed housing schemes.

Ministry of Trade -- occupational earnings x manufacturing industry, directory of approved companies, capital investments x manufacturing, and acreage of industrial land developed.

Ministry of Education — number of schools x primary and secondary x type, total enrollment x number of teachers, programmes of universities x students x graduates x types, and programmes of other post-secondary training institutions.

Ministry of Labour — unemployment, underemployment, multiple job holding, career guidance, collective agreement, industrial disputes, participants and beneficiaries in social security schemes, and industrial accidents.

Ministry of Agriculture — padi statistics (area, output, and yield), number of padi farmers x size of farms, number of farmers x household income, rubber smallholder (numbers x size), rubber replanting progress, production and productivity of rubber, fishery (number of fishermen x licensed boat x type of gear x mechanization), freshwater ponds x size x volume of catch, livestock, and estate sectors: rubber x oil palm x coconut (employment x occupation x earnings).

Ministry of Transport — household by ownership of motor vehicles, household expenditure on transport, number of taxis x bus x road haulage vehicles, employment x earnings in taxi x bus haulage companies, railways, port traffic, air traffic, and fuel price trends.

The above are examples of the types and variety of data collected by ministries. Appendix A, however, classifies all available data by general categories, namely, population and labour force, education and manpower development, employment, remuneration and labour costs, labour market functioning, mining and quarrying, agriculture, housing, health services, tourism, and transport and communications. These data are collected and compiled by many ministries and agencies, and oftentimes they are done in ignorance of each other's efforts. Consequently, all types of data and information are available but they are collected, classified, stored, and produced in a variety of ways. No inventory list is available.

As a general evaluation of the availability and effective utilization of the data and information collected by numerous agencies, the following are important observations:

1. Even though it cannot meet the detailed needs of all planning and administrative agencies, the Department of Statistics provides the most comprehensive and reliable data for overall national and state planning. So far, the Department has fulfilled the specific function for which it was created, namely, "to collect and interpret statistics for the purpose of furnishing information required in the formulation and carrying out of government policy in any field or otherwise required for government purposes or for meeting the needs of trade, commerce, industry, or agriculture (including forestry, fishing, and hunting)."2/

2. Data and information of all types, subjects, and specificity are available, but their usefulness to regional planning and administration are indirect and beset with problems: (a) The definition and classifications used are varied and may not conform to internationally accepted standards; (b) The coverage of information may be complete and fitted to the needs of the agencies collecting the data, but it does not necessarily meet the needs of many other planning and implementing agencies; (c) access to data and research findings by specialized departments is not open to the public or nonrelevant agencies because of confidentiality imposed by law or because of the lack of interdepartmental understanding and cooperation; (d) except in a few cases, most of the data collected are aggregated on national and state bases. Consequently, they are not readily useful for specific area, urban and regional planning; (e) with the exception of a few types of data, most government published data are out of date by the time they are released or published. Most data are collected during long periods or intervals of six years, five years, or ten years; and (f) until quite recently, most information and data collected by ministries and agencies are collected and filed in manual and inefficient forms. These traditionally stored data are not readily serviced, updated, or retrieved for purposes of planning and implementation.

INFORMATION SYSTEM FOR REGIONAL PLANNING IN MALAYSIA

KELANG VALLEY REGION AND INSTITUTION

The Kelang Valley Region

The Kelang Valley region is located on the Western Coast of Peninsular Malaysia and, as the name suggests, it is a valley area that is drained by the Kelang River. Administratively, the Kelang Valley region is defined as the areas within the boundaries of Kuala Lumpur Federal Territory and the districts of Gombak, Ulu Langat, Petaling, and Kelang in the State of Selangor. Figures 25 and 26 indicate the location of the study area.

The area of the Kelang Valley region totals 284,342 ha or 423.5 km^2 (1,097 mi^2) or 2.1 per cent of the total land area of Peninsular Malaysia. By the measure of physical size, the region is small and insignificant. But by the indicators of population concentration and the region's contribution to the Gross Domestic Product and economic growth of the country, Kelang Valley is dominant and very important economically and politically.

The Kelang Valley region represents the largest concentration of urban settlements and modern sectoral activities in Malaysia. Nearly 15 per cent of the total area has been built up for houses, offices, factories, institutions, utilities, and recreation. Even though the region constitutes 2.1 per cent of the physical area of Peninsular Malaysia, 18 per cent of the population lives there. During the 1970-80 period, a total of 418,645 people migrated to the region, or to put it in another way, 21 per cent of the population in Kelang Valley are people who have moved in recently during the last ten years. Economically and demographically, Kelang Valley has been an important "magnet/pull" region for Malaysians to seek employment and better income. The trend is predicted to continue for some more years until other growth centres and poles in the northwest, south, and east coast of Peninsular Malaysia achieve some level of threshold growth and development.

Other indicators that show the dominance of Kelang Valley in the country's socioeconomic life are reflected by the region's contribution to the GDP growth. Table 9.1 highlights these facts.

Kelang Valley contributes 38 per cent of the total GDP growth of Peninsular Malaysia in 1980. The GDP grew at an average of 11.5 per cent per annum during 1970-80, whereas other parts of the country grew at 7.3 per cent per annum. As indicated in table 9.1, Kelang Valley dominates in most of the economic sectors, particularly in trade and services (74 per cent), manufacturing (48 per cent), construction (46 per cent),

Figure 25. Location of Kelang Valley in Peninsular Malaysia

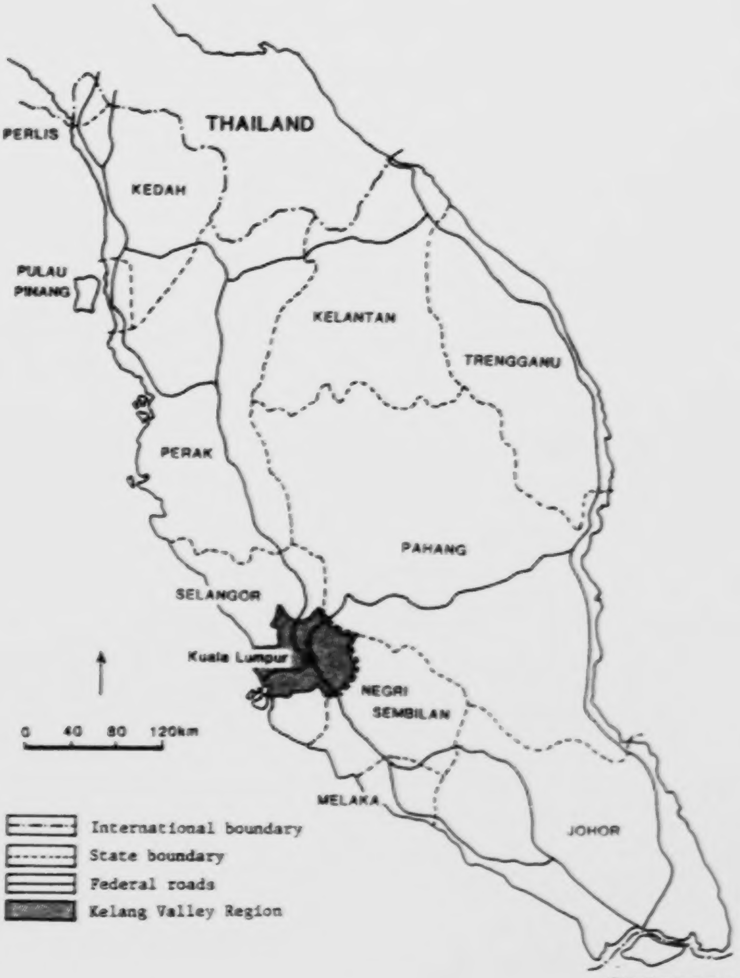
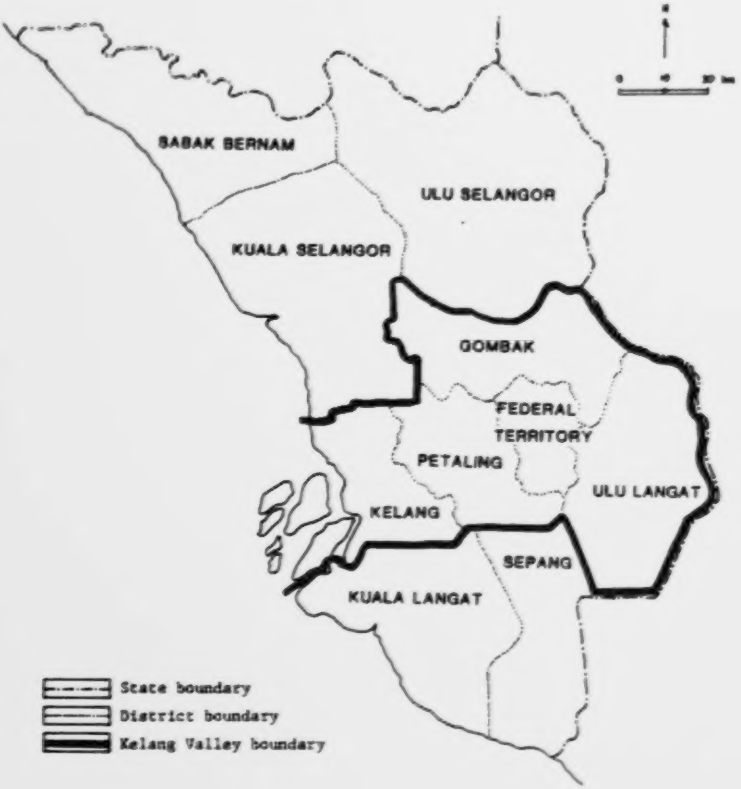

THAILAND
PERLIS
KEDAH
PULAU PINANG
KELANTAN
TRENGGANU
PERAK
PAHANG
SELANGOR
Kuala Lumpur
NEGRI SEMBILAN
MELAKA
JOHOR
SINGAPORE
0 40 80 120km
International boundary
State boundary
Federal roads
Kelang Valley Region

Figure 26. Kelang Valley: administrative boundaries


SABAK BERNAM
ULU SELANGOR
KUALA SELANGOR
GOMBAK
FEDERAL TERRITORY
PETALING
ULU LANGAT
KELANG
SEPANG
KUALA LANGAT
State boundary
District boundary
Kelang Valley boundary

transportation (40 per cent), utilities (31 per cent), and government services (23 per cent). The region is not important anymore in primary agricultural and mining activities. In summary, it is evident that Kelang Valley is very important from both the socioeconomic and administrative-political perspectives. Inevitably, thus, the region requires special attention and planning if it is also to help achieve the objectives of the Government's New Economic Policy. The Kelang Valley Planning Council, Planning Committee, and Secretariat were conceptualized in the early 1970s, but were only officially established in March 1981.

TABLE 9.1. KELANG VALLEY: GDP BY SECTORS, 1980

Sector	Value Added M$ Million	% Kelang Valley	% Penin. M'sia	AV. GDP Growth Rate
Agriculture	239	2.8	4.8	8.2
Mining	106	1.2	12.9	2.2
Manufacturing	2259	26.2	48.0	13.8
Construction	459	5.3	45.8	15.8
Utilities	165	0.8	31.1	13.6
Transport	639	7.4	40.1	14.4
Government Services	660	7.7	23.4	8.7
Trade & Services	4182	48.6	73.9	10.6
Total	8609	100.0	38.0	11.5

The Kelang Valley Institutional Organization

The Kelang Valley Planning Secretariat is a Division in the Prime Minister's Department and it services a Regional Planning Council chaired by the Prime Minister. The Secretariat's major responsibilities are:

(a) to prepare and coordinate the drafting of regional perspective plans, strategic maps, and development plans for Kelang Valley;

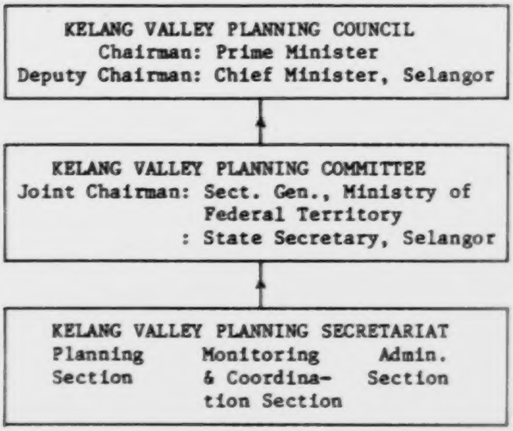
(b) to review the perspective plans and coordinate the preparation of development plans for the region every five years;

(c) to monitor and evaluate the progress and impacts of the implementation of development projects in Kelang Valley in order to ensure that they conform with approved regional development policies and strategies and, particularly the New Economic Policy;

(d) to promote collaboration, cooperation, and coordination of efforts between federal, state, and local departments and agencies concerned with sectoral, areal, and regional development planning in Kelang Valley.

Figure 27 shows the organizational structure of the Kelang Valley Planning Secretariat.

Figure 27. The Kelang Valley Planning Secretariat


KELANG VALLEY PLANNING COUNCIL
Chairman: Prime Minister
Deputy Chairman: Chief Minister, Selangor
KELANG VALLEY PLANNING COMMITTEE
Joint Chairman: Sect. Gen., Ministry of Federal Territory
: State Secretary, Selangor
KELANG VALLEY PLANNING SECRETARIAT
Planning Section
Monitoring & Coordination Section
Admin. Section

To date, the Kelang Valley Planning Secretariat has completed the drafting, and obtained the Planning Council's approval, of the Kelang Valley Perspective Plan. The Plan focuses on the following subject policies and strategies, and the year 2000 has been targeted as the perspective time frame:

(a) Population (including migration and distribution);

(b) Economy (including manpower, industry, and sectoral growth);

(c) Housing (including projected demands and low cost housing);

(d) Transportation (including road, rail, and public transportation);

(e) Utilities (covering electricity, water, and telecommunications);

(f) Environment (focusing on water and air pollution);

(g) Urban development (focusing on urban patterns, hierachy, and growth centre strategies); and

(h) Land use (focusing on long-term perspectives, land banking, and land use strategies).

The Kelang Valley Planning Council approved the Perspective Plan in early 1984, and now it has become the main Master Plan and authoritative guide for all future district and municipal structural and development plans. Any diversion or exception to the main policies and strategies of the Perspective Plan will have to be referred to and approved by the Kelang Valley Planning Council.

Another important responsibility of the Kelang Valley Planning Secretariat is the planning and establishment of the Kelang Valley Data Bank and Regional Information System. The Data Bank and Information System are to facilitate the work of Kelang Valley Planning Committee and Council in planning, monitoring, and coordinating activities and developments in the region and in deciding on policies and strategies. Although KEVIS (Sistem Maklumat Lembah Kelang or SISMAK) was started in 1983, in a practical and systems development sense, it will take a few years to install and function effectively. Time and manpower are required to collect, compile, input, process, validate, update, and output data. But, whatever the final systems configuration, the decision to create and install KEVIS has been made and the system has started to function and produce outputs and information.

THE KELANG VALLEY INFORMATION SYSTEM

Background and Rationale

The need for the creation and establishment of a regional data bank and information system for Kelang Valley had been felt and expressed even before the Kelang Valley Planning Secretariat was formed in 1981. Both the Kelang Valley Study and the Kelang Valley Review 3/ have highlighted the need and urgency of the establishment of a data bank and information system to help plan, monitor, and coordinate developments in Kelang Valley. The first concrete move towards the creation of the data bank was made in 1982, when the Centre for Policy Research, Universiti Sains Malaysia, Penang was commissioned to conduct a feasibility study. Consequently, the "Kelang Valley

Regional Planning Information System: A Feasibility Study"4/ became the major guide and model for the planning and development of KEVIS.

KEVIS has its roots in the National Integrated Data System (NIDAS) project conducted by Universiti Sains Malaysia in the State of Penang and the districts of Kuala Muda, Kedah, and Krian in Perak during 1976-79.5/ The NIDAS study was undertaken to demonstrate the technical and economic feasibility of constructing an integrated data system which could be the prototype of a national integrated data system for administrative planning and monitoring purposes. The NIDAS project then involved three major tasks, namely, data file development and the building of operational data systems, geocoding and the development of a geographic information system, and the development of application programmes using the data bases. However, KEVIS as it is now is not a replica or mere extension of NIDAS. KEVIS has the benefits of post-NIDAS experience and evaluation, and its present configuration and data structures are very much improved and are devoid of the original NIDAS problems and faults. Some of the original people involved in the NIDAS experiment became advisers to the KEVIS project and they took pains to advise avoidance of NIDAS' earlier mistakes.

The "Feasibility Study" was presented to the Kelang Valley Planning Committee and Council for discussion and approval. Approval was granted with the added instruction that the data bank and information system be established in phases but as soon as possible. Fortunately, the Kelang Valley Secretariat had the advantage of already having access to the mainframe computer facilities in the Prime Minister's Department. A new computer facility and a large core of computer staff were not immediately necessary to start the KEVIS project. In early 1983, a senior systems analyst and a programmer were posted to the Secretariat to continue the planning and development of the system that had already been started in late 1982 by "borrowed" personnel from the National Institute of Public Administration (INTAN) and the Implementation Coordination Unit (ICU) which also controls and services the mainframe computer in the Prime Minister's Department. A set of graphic computing system was also purchased and installed in early 1983 in the Secretariat's own office building. A pilot project to test the feasibility of the Land Information System was started in Mukim Ampang, Kuala Lumpur in December 1982. The geocoding and digitizing of basic maps were also started in mid-1983 by utilizing the Tektronix 4054A graphic machine and other peripherals as indicated in figure 30.

The Concept and Components of KEVIS

The concept of KEVIS can be synthesized as follows:

(a) an information system that has its own core data files but depends on other sources and systems for operational data and information;

(b) a systems structure that manifests features of centralization of critical and summary data but a decentralization of data collection, compilation, and storage at state and district level facilities; and

(c) a system that depends a great deal on coordination and standardization of data definition, collection, and structures, and the interfacing and linkages of many data bases and systems.

The conceptual configuration of the KEVIS system is illustrated in figure 28. Three central computer and information facilities are involved, namely, those at the Prime Minister's Department, Selangor State Secretariat, and the Ministry of Federal Territory and Kuala Lumpur City Hall (the latter two institutions share the same computer). However, the only operational facilities are those at the Prime Minister's Department and Kuala Lumpur City Hall. Interfacing of the facilities is being done.

KEVIS is in reality an integrated information system that has under it five major semi-independent data based systems (see also figure 29): (a) Land Data System (LADAS); (b) Statistical Information System (SIS); (c) Project Monitoring System (PROJEK); (d) Property Information System (PIS); and (e) Computer Aided Mapping System (CAM). Because of limited computer personnel and constraints of funds to collect data, the actual creation and development of the five systems were scheduled according to priority. For immediate implementation in 1983 were the Land Data System, the Computer Aided Mapping System, and the Statistical Information System. Phased for implementation in early 1984 was the Project Monitoring System, and in 1985/86 the Property Information System will be attempted.

Land Data System

As indicated in figure 29, LADAS has four data based subsystems, namely, quit rent administration system (QRAS), alienated land information system (ALIS), temporary occupation licence administration system (TOLAS), and inventory of unalienated land (IUL). The details of the data collected by the various subsystems of LADAS are listed in Appendix B. Since the number of lots in Kelang Valley totals more than 500,000

Figure 28. Configuration concept of Kelang Valley Information System, Prime Minister's Department, Malaysia

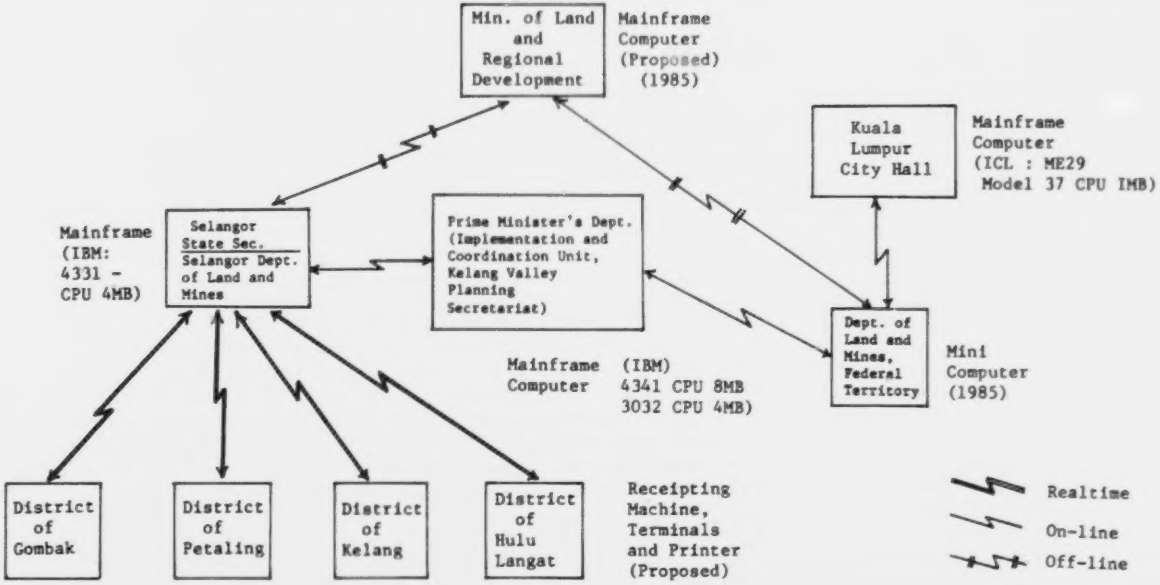
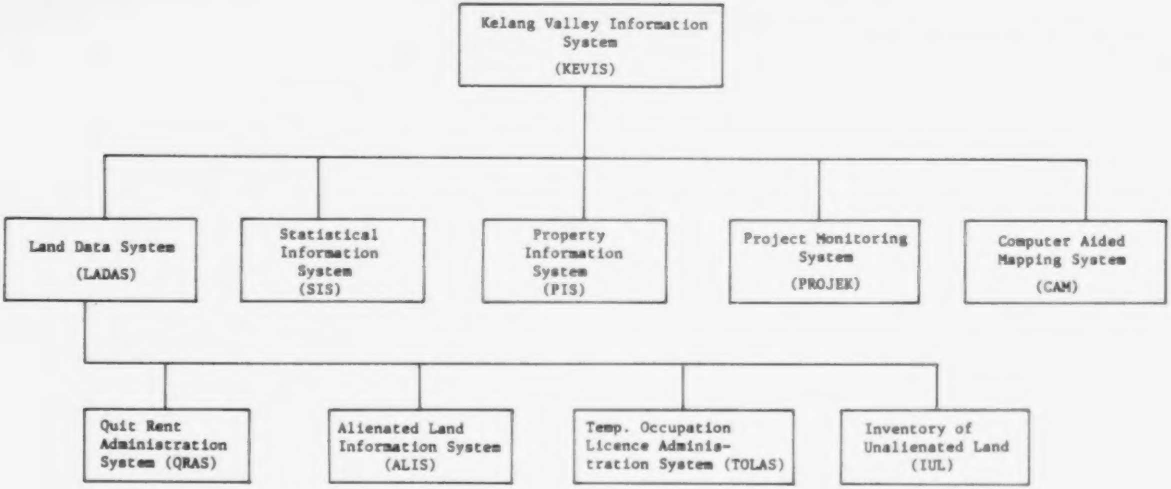

Min. of Land and Regional Development
Mainframe Computer (Proposed) (1985)
Kuala Lumpur City Hall
Mainframe Computer (ICL : ME29 Model 37 CPU IMB)
Mainframe (IBM: 4331 - CPU 4MB)
Selangor State Sec.
Selangor Dept. of Land and Mines
Prime Minister's Dept. (Implementation and Coordination Unit, Kelang Valley Planning Secretariat)
Mainframe Computer (IBM) 4341 CPU 8MB 3032 CPU 4MB)
Dept. of Land and Mines, Federal Territory
Mini Computer (1985)
District of Gombak
District of Petaling
District of Kelang
District of Hulu Langat
Receipting Machine, Terminals and Printer (Proposed)
Realtime
On-line
Off-line

Figure 29. Kelang Valley Information System, Prime Minister's Department, Malaysia


Kelang Valley Information System (KEVIS)
Land Data System (LADAS)
Statistical Information System (SIS)
Property Information System (PIS)
Project Monitoring System (PROJEK)
Computer Aided Mapping System (CAM)
Quit Rent Administration System (QRAS)
Alienated Land Information System (ALIS)
Temp. Occupation Licence Administration System (TOLAS)
Inventory of Unalienated Land (IUL)

and the amount of information on each lot is large, the time required to complete the creation of ALIS and QRAS will at least be two-and-one-half years and the computer storage capacity to be made available must at least be 60 x 500,000 or 30 megabytes. The optimistic time estimate assumes that data collection, data entry into the computer, and application programmes can be done simultaneously in all the districts with the help of relevant, sufficient, and full-time computer personnel and enumerators.

The final configuration of LADAS will manifest a decentralized systems structure (see figure 28). All land data collection, storage, and processing in the Federal Territory will be done at the office of the Kuala Lumpur Director of Land and Mines, with the facility of a minicomputer. For Selangor State, data collection and compilation will be done at the district offices but storage and processing will be done centrally at Selangor State's mainframe computer in Shah Alam. On-line terminals and peripherals will be installed to link the district offices and Shah Alam. Even though the Kelang Valley Secretariat will be responsible for initiating the creation of LADAS in all the land offices, the permanent management and maintenance of the systems will rest with the Director of Land, Selangor. Selangor State was scheduled to install a mainframe computer in November 1984 and the Kuala Lumpur Land Office was supposed to purchase a minicomputer in early 1985. In the meantime, all compilation and processing of land data are done at the Prime Minister's Department's computer via the Kelang Valley Planning Secretariat. In future, when all Selangor and Federal Territory systems are operational, the Kelang Valley Secretariat will be a recipient of relevant land planning information through an off-line terminal linked to the various central computers. Interfacing of the systems will not be a problem because the computers in the Prime Minister's Department and the Selangor State Secretariat are of the same name brand.

Statistical Information System

The establishment of the Statistical Information System, that focuses on baseline and updated data, is part of the core function of the Kelang Valley Planning Secretariat. Appendix C lists the socioeconomic and physical planning data that are continuously maintained and regularly updated by the Secretariat. The sources of these SIS files are the Department of Statistics, the State Economic Planning Unit in Selangor, the district offices, as well as data from the Secretariat's own primary research and investigations. SIS is a centralized information system located in the Secretariat itself. It is planned that eventually the more important and regularly used data in SIS will be linked to some of the computerized maps under the CAM System.

Computer Aided Mapping System

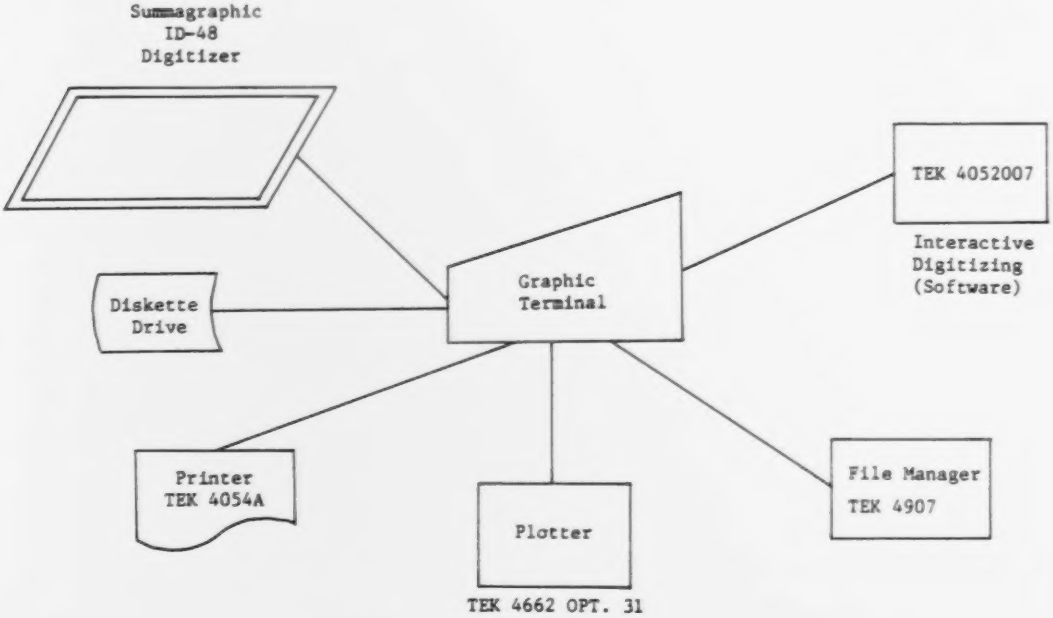
The Computer Aided Mapping System is another subsystem of KEVIS that will be centralized and located at the Kelang Valley Secretariat. CAM involves the digitizing and drawing of important maps in the computer for purposes of efficient storage, easy retrieval, special data processing, and effective visual reference during meetings and decision making processes. The attribute files and maps stored, and planned to be stored, under the CAM project are listed in Appendix D. The standard statistical unit (SSU) used by CAM is the mukim (or parish area) within which are identified the census enumeration blocks. The present and future efforts of CAM will not attempt to duplicate or compete with the work of the Department of Survey and National Mapping, which produces cadastral and other maps, or the Department of Agriculture, which produces land use maps. The CAM facility will remain small and dedicated to regional data and some special subjects. (See figure 30 for configuration and hardware.)

Project Monitoring System

The project monitoring system of KEVIS has two primary activities. The first is the collection, analysis, and monitoring of data and phenomena that are uniquely Kelang Valley's concerns, such as pollution of the Kelang River, squatters on railway land, Malay reservation land, and unutilized town and government reserve land. These data files are created and maintained by the Secretariat itself and not shared with any other agency. The second activity deals with information that is acquired by the Secretariat from other operating, planning, or monitoring agencies. This includes progress of projects of the Federal and State Governments, and progress and costs of special projects.

This information is derived from the SETIA system which involves the interfacing of computers and data bases of the Implementation Coordination Unit, the Economic Planning Unit, the Treasury, and the Accountant General's Office. The other source is the State Development Office of Selangor State which supplies at three months' intervals, selected information on progress of socioeconomic projects undertaken by federal and state agencies in Selangor that have impacts and implications to Kelang Valley. The transfer and sharing of information are made easier because the Implementation Coordination Unit, the Economic Planning Unit, and the Kelang Valley Planning Secretariat share the same central computer facility, and the Selangor State computer will be linked through an off-line facility to the Kelang Valley Secretariat.

Figure 30. Configuration of Tektronix 4054A Graphics System, Kelang Valley Planning Secretariat


Summagraphic
ID-48
Digitizer
TEK 4052007
Interactive
Digitizing
(Software)
Graphic
Terminal
Diskette
Drive
Printer
TEK 4054A
Plotter
TEK 4662 OPT. 31
File Manager
TEK 4907

The data collected by PROJEK are listed in Appendix E. The range of data is wide and the file structures created are varied. Some of the data files can be linked through a common ID of mukims, and hopefully, eventually there will be some integration between the PROJEK and CAM files.

Property Information System

As had been indicated earlier, the development of the property information system has been postponed until 1985/86. The delay is not because information on property is not important to the planning of Kelang Valley, but because some local governments and the Division of Valuation, Ministry of Finance are already studying the possibility of computerizing property assessment records and transactions of property sales. It is more economical in the long run to wait for the outcome and output of the proposed property information systems, and the Secretariat will tap some of the relevant data records when the proposed systems become operational.

Appendix F lists the main information PIS hopes to collect and store in the computer. Some of the data will not be collected by the systems proposed by the local governments and the Ministry of Finance. In these areas PIS will have to undertake its own surveys or sampling techniques. As in the other subsystems of KEVIS, eventually some kind of spatial link (through maps) needs to be made between PIS and CAM to ensure that statistical data can be translated into geographic and planning information.

EVALUATION OF KELANG VALLEY INFORMATION SYSTEM

Information Use in Regional Planning

The evaluation of KEVIS has to take cognizance of a number of facts. First, KEVIS is a dedicated system created and developed for the special needs of the Kelang Valley region and its planners and administrators. KEVIS is not a general purpose data bank and information system and, as such, does not collect nor store a wide range of data or satisfy the wide spectrum of planning, academic, and administrative needs. KEVIS is also a government sponsored information bank that collects and analyses government-type information, which makes it inaccessible to the general public or personnel of nonrelevant agencies. Equally important to note, is the fact that KEVIS is still being designed and developed, and its full impact and effectiveness have not been realized. Because of these factors and constraints, KEVIS cannot be assessed based on universal criteria and normal measures of effectiveness.

Who Uses Information?

Except for a few confidential files, data from KEVIS are generally available to a wide range of government planners and administrators. By category or type, information from KEVIS has been made available to national planners from the Economic Planning Unit and the Implementation Coordination Unit, to state planners from Selangor State and the Federal Territory, and to local government planners from Kuala Lumpur City Hall, Petaling Jaya Municipality, Kelang Municipality, Shah Alam Municipality, and other district councils in the Kelang Valley. Sectoral planners and project managers from governmental and semigovernmental agencies concerned with housing, industries, transportation, and utilities have consulted the Secretariat and have been furnished with relevant data stored in KEVIS. Contractors who are laying telecommunication cables and new gas pipeline, and consultants who are preparing urban structure plans for Shah Alam, Kelang, and Bangi towns have discussed planning targets and strategies with the Kelang Valley Secretariat, and consequently have had access to some relevant information from KEVIS.

Because of the nature and purpose of KEVIS, it is not open or accessible to private individuals, private sector groups, academic researchers, or personnel of unrelated agencies. It is possible, however, at a later stage when the system is fully developed, that some aspects of Kelang Valley environment and planning may be published as quarterly or annual reports for public knowledge and distribution.

Three types of problems are generally encountered by planners and administrators when they use KEVIS in their work today. The first and obvious problem is that KEVIS subsystems are not fully developed, especially LADAS and PROJEK. As had been indicated earlier, LADAS requires at least two more years before all the ALIS and QRAS files can be established for all districts and the Federal Territory. Information essential for PROJEK from the State Government is still being compiled in a new computer-based format for SETIA's use at the Implementation Coordination Unit and for entry into Selangor State's computer. As of now, KEVIS has the necessary baseline data under SIS, land information on a few mukims in Kuala Lumpur and Gombak under LADAS, some current information on certain Kelang Valley problems in PROJEK, and some geographic information maps on certain subjects under CAM.

The second problem is that many files in KEVIS contain information obtained originally from other agencies such as the Department of Statistics, district offices, State Government, and other operating agencies. Information is filed in summary and reclassified form to fit Kelang Valley's needs and KEVIS computer programming. The non-Kelang Valley planners may find the information too limited and structured for their requirements. Third, because KEVIS and the Kelang Valley Planning Secretariat have been only recently established, the earliest baseline data available are for 1970 and even these are for certain subjects only. KEVIS cannot provide historical trend data.

What Information Is Used by Planners?

The list of basic statistics collected and maintained by KEVIS is identified in Appendix C. The data list is not as extensive as the normal list used by most national and regional planning agencies because Kelang Valley is essentially an urban area and the function of the Kelang Valley Planning Secretariat is confined to sociophysical planning in the defined region. Consequently, this list deemphasizes basically "rural-type" data, such as agriculture, forestry, fisheries, and mining. The data base also does not have information on money and banking, government budgeting, and social indicators (television, radio, refrigerator, air-conditioners, or motorcar ownership). However, it needs to be noted that SIS and the baseline data collected were based on the need and experience of preparing the Kelang Valley Perspective Plan during 1982-83. Because the objectives and contents of the Perspective Plan were urban planning and proposed regional policies and strategies, the data that were collected, and then stored in SIS, were found to be adequate and relevant for Kelang Valley planning.

The Kelang Valley Planning Secretariat is currently involved in a different type of planning, namely, to prepare a subregional or district plan for one of the districts in Kelang Valley. The current experience indicates that KEVIS does not have the detailed data to assist in the planning of a local or specific subregional area. The current exercise requires the undertaking of primary surveys and the collection of additional information from the State Government and the Department of Statistics. One observation that can be noted is that information existing in KEVIS is ideal for sociophysical and urban regional planning but is inadequate for national and subregional planning. After all, KEVIS is a dedicated regional planning and monitoring system.

Why Is Information Not Used Effectively?

There a number of reasons why information in a particular data bank is not used effectively. The experience of KEVIS highlights the following situations:

1. The problem of updating or ensuring that information is current and up-to-date is difficult to solve. First, it requires the help of operating agencies that are themselves busy with normal routine activities. Updating involves time, manpower, and money. Because of these difficulties, oftentimes, information is left obsolete which makes it inadequate for certain planning and decision making purposes. Information on squatters, ownership of land and owners' addresses, and population by race needs to be frequently updated.

2. Some kind of information cannot be used effectively because it does not give the required details (e.g., list of names of housing development companies cannot be classified according to ownership by race which is an important concern of planning under the New Economic Policy).

3. Doubtful reliability of data sometimes make them useless in planning and policymaking. Data obtained from the district offices regarding the number and size of areas of housing projects that have been delayed for more than two years was questioned because each district office defined "project delays" differently. A proposed policy paper had to collect new data because the comparability and reliability of the earlier information was doubted.

Problems of Availability of Data

Problems of availability of data are typical of all planning efforts. Even if data are available they are not from a single source or data bank nor structured in ready-made form for planning. The experience of using KEVIS indicates the following problems:

1. Socioeconomic data on a disaggregated district and *mukim* level are not available. A primary survey is being undertaken in Gombak district to collect information on registered and illegal industries, commercial premises and their ownership, and squatters.

2. KEVIS is a central data system that depends on the cooperation of operating agencies for the supply of various types of data and information. Unless these agencies are requested and pressured, information is not given, especially if it is sensitive. This makes the updating of data bases more difficult. Because of this, lags occur between data base creation and data base updating.

3. When data are not available, manpower, time, and money are required to search and collect them. No organization has unlimited funds or many idle personnel to carry out surveys and collect information. Because of such constraints, sometimes planners resort to proxy indicators or make projections and interpolations based on "old" and obsolete data.

4. The Kelang Valley Secretariat does not experience problems of acquiring information because of confidentiality of data. The fortunate situation is that the Department of Statistics forwards data to the Secretariat much earlier than to other agencies.

In the absence of data, planners in the Kelang Valley devise a few measures, namely:

1. Commission relevant government agencies to undertake studies but at no cost to the Secretariat. The case of the Socioeconomic Research Unit's assistance in conducting a study on factors influencing location of industries is an example.

2. Use postulated data based on standards and models from other countries. This example involves the calculation of the size of areas required for recreational and/or buffer zone purposes. A European standard was adapted to the Malaysian situation and the desired area size was proposed.

3. Use proxy information to draw conclusions for long-term planning purposes. The number of applications to convert agricultural land to nonagricultural uses was interpreted as an indicator of "pressure points or poles" for future housing and public utilities projects.

Methods and Procedures of Data Collection

Generally, two methods are used to deposit data in KEVIS. One method is the transfer of summarized ready data from another data bank or information source to KEVIS, either in the form of computer tapes or completed printed forms or format provided by the Kelang Valley Secretariat. The information sources are the Department of Statistics, the State Planning Unit of Selangor, the City Hall, and the district offices. The other method is by undertaking primary surveys and research from secondary sources. Both methods are used by the Kelang Valley Secretariat to create and maintain KEVIS.

The Secretariat does not anticipate to conduct statistical, household, or social surveys in the near future. Data that are collected from such massive exercises, though infrequently updated, are already available from the Department of Statistics and the Socioeconomic Research Unit. The Department of Statistics conducts population and housing censuses every ten years and agricultural and household surveys every five years. The Socioeconomic Research Unit undertakes social surveys on such subjects as poverty and the role and image of government in development. Of course, the problem with the findings and data from these surveys is that they are aggregated on national and state bases. To ensure that these data are relevant to Kelang Valley, additional processing of the data base and special large sampling surveys of the area are required. Any intercensal or intersurvey updating of information is done by interpolation, calculated projections, or special sampling studies for selected areas.

Reconnaissance surveys or field visits by the planning staff are undertaken in the preparation of the draft development plan of Gombak district. Limited questionnaire surveys will also be undertaken to collect information on household income and commercial activities in the district. So far, techniques such as group discussion with planning clients, confidential interviews, hearings, and meetings have not been found to be of relevance to the current efforts of planning for Gombak district. However, aerial photo, record examination, and data through administrative procedures have been found useful in the Gombak planning exercise. In fact, computer graphic mapping is one of the subsystems of KEVIS and Gombak district is one of the important study areas.

Frequency of Data Collection

As had been mentioned earlier, the Secretariat does not undertake primary surveys because there are already line agencies collecting and compiling information relating to their specific and broad functions. The frequency of data collection and updating by these agencies varies considerably according to the type of information and the expected use of such information. Consumer and producer prices are monitored daily, but aggregated according to weekly and monthly indices. Statistics on registered motor vehicles are collected daily and summarized monthly or yearly. Employment and production statistics for industrial enterprises are collected on a quarterly basis, while those for rubber, oil palm, and padi sectors are collected on an annual basis.

Information stored and maintained by KEVIS also includes data collected and compiled by the Kelang Valley Secretariat itself. This is particularly true in the cases of PROJEK, SIS, and CAM systems. No standard frequency of data collection and updating can be imposed because the data types and uses vary considerably. Data on squatters on railway land is updated every month, while data on the "status of the water and air environment" is monitored every quarter. Some planning data, such as type and number of social organizations and community facilities, are only compiled during the plan preparation phase. Generally, those subject areas and development concerns that are monitored closely are updated on a monthly, quarterly, or semiannual basis. But the frequency of data collection and updating also depends on staff, time, and funds availability as well as the cooperation and support of client and target agencies and sectors.

Percentage Utilization of Collected Data in Plan Making

In the real world of information systems design and development, it is unrealistic and inefficient to collect and store data meant only for planning needs and purposes. KEVIS, for example, was created and developed for both planning and monitoring purposes. In fact, what is happening now is that KEVIS is also storing and processing data meant for routine administrative purposes. The rationale is that, at least during the initial stages, modernization and electronic processing of administrative activities are prerequisites before "clean and standardized" data or records can be maintained and produced. The computerization of land records and land administration processes, for example, is an important step before reliable land information can be extracted and compiled.

It is difficult to assess the percentage of KEVIS collected data that is utilized in the preparation of plans or for monitoring and administrative purposes. At this juncture of KEVIS development, most of the data are baseline information, about 20 per cent are data stored and updated for purposes of monitoring, and the rest are QRAS and ALIS files that have both administrative and planning uses.

Sources of Information Used

Regional development planners have to obtain published or unpublished information from wherever they are available. Planners cannot rely on any single or few published and unpublished sources. In the preparation of the Kelang Valley Perspective Plan, for example, the incumbent officials in the ministries and departments provided more up-to-date sources and the latest thinking about certain issues and projects. Officials of operating and planning agencies are not the sources of published and unpublished information, but they can be the sources of knowing about published and unpublished sources.

The Kelang Valley Secretariat's effort in preparing the Kelang Valley Perspective Plan illustrates the use of information sources for regional planning. During the planning exercise, the following published sources were utilized: (a) Population and Housing Census Reports, 1970 and 1980; (b) Kelang Valley Study, 1973; (c) Kelang Valley Review, 1979; (d) Kuala Lumpur Draft Structure Plan, 1980; (e) Fourth Malaysia Plan, 1981-85; and (f) Kuala Lumpur Transportation Masterplan Studies, 1980. These reports were prepared by various agencies and consultant groups. They represent complex data sources that focus on both national and subregional issues and statistics.

Other documents that were consulted during the preparation of the draft Perspective Plan included the following:

(a) Draft Shah Alam Extension Plan;

(b) Statistical Bulletin of Government Personnel Records Centre, Public Services Department;

(c) Masterplan and Feasibility Study for Sewerage and Drainage Systems Project in Kelang, Port Kelang and its Environs, JICA, 1982;

(d) Kuala Lumpur-Tanjong Malim Expressway: A Feasibility Study;

(f) Preliminary Noise Study in Malaysia, Department of Environment, Ministry of Science and Technology, 1982; and

(g) Housing Developers' Association Reports, 1980-82.

These documents contain more technical and specific information on Kelang Valley.

Besides the above mentioned sources of information and data, the study team also examined unpublished reports by the following: Ministries of Agriculture, Education, Health, Housing, Transport, and Labour; local governments; Bank Negara; Malaysian Industrial Development Authority; and public corporations such as the Selangor State Development Corporation and the Urban Development Authority. One of the first documents scrutinized by planners in Kelang Valley were the land use and soil survey maps.

Aerial photographs of Kelang Valley with larger than normal scales were obtained from the Department of Survey and Mapping. A special land utilization survey of all four districts in Kelang Valley was conducted in 1982 with the assistance of the Federal Department of Town and Country Planning. Relevant ministries and departments were called to attend meetings and discuss draft technical papers on each chapter of the draft Kelang Valley Perspective Plan. The technical meetings provided additional inputs and information on particular subject issues and policy proposals of the draft plan, and they were sometimes more valuable than the currently published reports and data.

Data and Information Gaps in Regional Planning

Instances of information gaps during planning in Kelang Valley exist in spite of KEVIS. Gap here is defined as the difference between what data are actually required for planning and what are readily available and actually stored in the information bank. In the experience of preparing the Kelang Valley Perspective Plan, the gaps were wide because Kelang Valley was only officially and physically defined in 1981. Prior to 1981, all census and statistical records treated Selangor as a state with nine districts and Kuala Lumpur as another entity. To start the planning of Kelang Valley as administratively defined, then required the disaggregation of all previous state and federal records and statistics. It took a great deal of efforts by the staff of the Kelang Valley Secretariat and the Department of Statistics to unravel the massive data and arrive at the correct information and statistics for Kelang Valley. In some instances, a few sample surveys were conducted to verify the assumptions used. In fact, the exercise of preparing the Perspective Plan was useful in helping to identify the data necessary for regional planning that should be regularly collected, maintained, and updated. The baseline data in the Statistical Information System of KEVIS were derived from the basic information collected for the Perspective Plan.

The preparation of the Gombak District Plan highlights a different type of information gap. The major gaps lie in the limited availability of disaggregated information at the subregional, district, and mukim levels. This information gap is being redressed by consulting district departmental agencies, ground surveys, and special aerial photographs, and scrutinizing detailed local physical and socioeconomic reports and proposed projects.

DATA PROCESSING AND INFORMATION DISTRIBUTION METHODS

Data Processing and Analysis

Both manual and computerized data processing and analytical methods are used by planning and administrative agencies in Kelang Valley. As had been indicated in figure 28, there are primarily three information centres involved in the Kelang Valley information network, namely, the Prime Minister's Department, the Selangor State Secretariat, and the Ministry of Federal Territory/Kuala Lumpur City Hall. The Prime Minister's Department and Kuala Lumpur City Hall data centres are fully computerized, while Selangor State was supposed to have its hardware installed in November 1984. However, while the central agencies are computerized, the peripheral and subregional departments and offices are still manually operated. The collection of raw data or reports is done at each subregional district office and town. For administrative and operations type statistics, manual processing at the district and municipal levels works adequately. But, when it comes to the state and regional levels, the data becomes massive and complex and a computer inevitably becomes necessary.

Besides the three central agencies mentioned, the Petaling Jaya Municipal Council, the Public Works Department, the Department of Water Supply, and the State Treasury have their own computer systems for billing, accounting, and basic data systems. Under the plan currently implemented in Selangor State, other state agencies will start computerizing in 1985. Work is now focused on the State Economic Planning Unit, the Department of Land and Mines, the State Development Office (branch of Implementation Coordination Unit, Prime Minister's Department), and the Department of Housing. The next phase is the linking of the state computer with the four district offices in Kelang Valley. It is also planned that in the near future, wherever relevant and appropriate, all government administration and records will be systematized and computerized.

Kind of Information Processed By System

KEVIS subsystems are mainly programmed to process and analyse quantitative data either in alphabetical or numeric forms. As it is presently applied, the computers are not meant to process qualitative data unless the data have first been categorized and quantified before being entered into the computer and processed. For reports and descriptive data, the systems allow the writing and storing of texts and scripts in special files and disks. A number of software packages are available to IBM computers to process quantitative data and manage data bases. These include SPSS, SAS, QBE, CLIO, MPSX, ECOT, IFPS, and IMS.

Problems or Deficiencies in Existing Computerized Data Systems

The problems or weaknesses of existing computer data systems can be summarized as follows:

1. Systems design and conversion are costly and time consuming processes. They need to be started all the way from the federal or central agencies to the local and district agencies and departments. Costs are involved in hardware and software purchases and employment of technical personnel.

2. Data entered in the computer have to be "cleaned" and standardized. At source levels, namely, the department and district offices, they require administrative and management reform, modernization, and mechanization rather immediately.

3. Depletion of technical staff in government computer installations can be attributed to the attractiveness of working in the private sectors. Consequently, it is difficult to retain good systems analysts, engineers, and programmers.

4. Different systems use different hardware, software, and application programmes. This causes difficulty of linking or interfacing of the different systems. The creation of SETIA system to link three important computer systems was a governmental measure to eliminate the multiple computer systems problem.

5. Too rapid computerization efforts have caught many government personnel by surprise and unprepared. There are a few cases of computer installations with large capacities which are not fully utilized, because the personnel are not fully trained or geared to use computers.

Techniques Used in Analysis and Application of Data

A number of analytical and presentation techniques are used by the Kelang Valley Secretariat in its planning and monitoring activities. Some of the common techniques used are, as follows:

1. Use of statistical techniques. Statistical techniques such as mean, mode, average, correlation, and linear and multiple regression analysis in the SPSS and SAS packages are frequently used.

2. Time analysis of population, migration, GDP, agricultural production, and status of the environment are also useful.

3. Graphic presentations. The Secretariat presents data in manual form (maps, tables, and graphs) for greater clarity and impact in plan or policy case presentation. Computer graphics and digitized maps under CAM will be more extensively used for planning and monitoring meetings. The use of models has not been adopted for case presentation as yet.

Methods Used in the Analysis and Application of Data

Not many of the sophisticated models and analytical methods of regional planning have been used during the preparation of the Kelang Valley Perspective Plan or other policy papers for the Planning Council. One reason is that staff expertise in the Secretariat is limited and the data necessary to facilitate such sophisticated exercises are not readily available and reliable. Shift-share analysis was attempted in the Kelang Valley Plan report, and some aspects of the economic base model were used in urban centre location analysis during the technical paper preparation phase.

ORGANIZATION OF KELANG VALLEY INFORMATION SYSTEM

Types of Organization Supplying Information

Information captured by KEVIS is obtained from numerous sources (e.g., Department of Statistics, ministries, state government agencies, and nongovernmental organizations such as the Housing Developers' Association, Sahabat Alam Malaysia (Friends of Environment, Malaysia), Chambers of Commerce, and Consumers' Associations). The agencies can be categorized, as follows:

1. Central statistical agencies — Department of Statistics, Public Services Department, Ministry of Labour, Social Security Organization, Employees' Provident Fund, and Family Planning Board — for national demographic and employment data.

2. Ministries of Agriculture, Education, Transport, Utilities and Power, Federal Territory, Trade and Industry, Finance, and Public Enterprises — for information on production and records of various sectors of the economy.

3. State Government of Selangor and Ministry of Federal Territory and their subordinate agencies — for all types of land, economic, and social information.

4. Local governments such as Petaling Jaya, Kelang, and Shah Alam municipalities, Kuala Lumpur City, and Gombak, Ulu Langat, and Petaling District Councils — for detailed information on urban housing, community services, and facilities.

5. Planning and research units such as Economic Planning Unit, Implementation Coordination Unit, and Socioeconomic Research Unit — for the supply of relevant reports and information important for Kelang Valley planning and development.

6. Nongovernmental organizations such as the Housing Developers' Association, Sahabat Alam Malaysia, Consumers' Associations, political parties, and universities — for comparative data and views on various subjects.

Linkage of KEVIS and its Environment

To ensure that KEVIS obtains the necessary data, and functions as expected, it has to have strong and mutually beneficial linkages with its environment and client agencies. Figure 28 describes KEVIS configuration in the context of other systems and organizations in Selangor and the Federal Territory. There are administrative linkages between the Kelang Valley Secretariat and other agencies, but now they are physically linked through the computer data line. The linkage is further reinforced through the Kelang Valley Planning Committee and the Kelang Valley Council, whose members are heads of federal, state, local government, and district agencies. Even though it has not met yet, there is also a standing task force created to advise and guide the implementation of KEVIS. So far, the task force has not found it necessary to meet because the status, progress, and problems of KEVIS have already been discussed many times by the Planning Committee and the Council.

The link between the computer users and vendors continue because of contractual obligations and also because continuous link offers possibility of further sales of new model machines, software packages, and spare parts by the vendors. For example, IBM's after sales services are good and it has world network of facilities in cases of problems and technical consultations. The Kelang Valley Planning Secretariat also continues to maintain links with the Universiti Sains Malaysia and other academic and training institutions that can provide advice on new technology for regional planning and information management.

Flow of information from bottom-up and top-down is occurring all the time. At this stage of KEVIS development (i.e., data collection and systems development), the bottom-up flow is more prevalent than the other direction.

Classification of Regional Information System

KEVIS is a special purpose system for urban regional planning and monitoring. KEVIS has also been designed to be a proactive data bank for important information on Kelang Valley.

Staffing of KEVIS

The Kelang Valley Planning Secretariat shares computer facility with the Prime Minister's Department's main computer facility which is managed and controlled by the Implementation Coordination Unit. The installation at the Prime Minister's Department is managed by a large core of professional and technical staff. Selangor State has five systems personnel to start the computer project and hopes to have about twenty professional staff to manage and maintain its computer facilities. The computer unit in the Kuala Lumpur City Hall is managed by sixteen systems personnel. The Kelang Valley Planning Secretariat has the smallest number of technical staff manning its limited hardware facilities. Two systems analysts and three programmers manage the terminals, printer, and graphic systems. There are four other support staff.

The development of KEVIS is not in the hands of a few computer personnel only. KEVIS is equally the responsibility of many other non-EDP personnel in the Secretariat, namely, two economists, two physical planners, one statistician, one civil engineer, one sociologist, and three general researchers. Hopefully, when situations permit, more professional staff can be added to help develop and manage KEVIS.

SUMMARY

The Kelang Valley Information System is a unique and ambitious project to establish a computerized urban regional information system. It is not yet fully developed or functioning effectively. But it is an important exercise in conceptualizing, designing, and implementing an information system for regional planning in Malaysia. It is still a learning process, and it hopes to learn from other experiences and systems in the world.

NOTES

1/ See Department of Statistics, Outline of Work (Kuala Lumpur, 1982), pp. 68-82.

2/ Act of Parliament No. 34 of 1965 - Statistics Act, 1965, No. 2 (2).

3/ Shankland Cox Partnership et al., Kelang Valley Study (1973); and their Kelang Valley Review (1979).

4/ See "Kelang Valley Regional Planning Information System: A Feasibility Study" (Penang: Centre for Policy Research, Universiti Sains Malaysia, 1982).

5/ "NIDAS - Final Report" (Penang: Centre for Policy Research, Universiti Sains Malaysia, 1982).

APPENDIX A. PLANNING DATA BY GENERAL CATEGORIES

1. Population and Labour Force in General (size of population; births; deaths; migration; and size of labour force).

2. Education and Other Manpower Development Programmes in General (programmes of universities; programmes of other post secondary training institutions; secondary schools; primary schools; other manpower development programmes; in-service training in private establishments; registration of scholarships; and trade testing institutions).

3. Employment in General (size of employment; engagements; vacancies; mobility and career development; dismissals; retirements; and duration of work).

4. Remuneration and Other Labour Costs in General (level and distribution of earnings; remuneration for nonworking hours; bonuses; benefits in kind; housing costs; social security costs; training costs; social facilities costs; and payroll taxes).

5. Labour Market Functioning (unemployment; underemployment; multiple job holdings; career guidance; collective agreements; industrial disputes; participants/beneficiaries in social security schemes; and industrial accidents).

6. Mining and Quarrying (number of mining/quarrying; type of mine/quarry; and mining size).

7. Agriculture (logging; FELDA schemes; padi x area x output x no. of farmers; income; rubber, oil palm, coconut, others; fishery; and livestock).

8. Housing (no. of units; no. of developers; and list of projects).

9. Health Services (no. of health centres x type; no. of hospitals; and no. of doctors and nurses x other health staff).

10. Tourism (hotel industry; listing of hotels; and listing of travel agencies).

11. Transport and Communication (no. of metre vehicles; no. of taxi, bus, and road haulage; and fuel price trend).

APPENDIX B. DATA COLLECTED BY LAND DATA SYSTEM (LADAS), KEVIS

ALIS Data Base

1. Basic Lot Information (lot number; locality; title, type and number; land use; acreage; expressed condition; restriction in interest; and land value).
2. Ownership Information (Name and address; I.C. number; ethnicity; category; and nationality of owners).
3. Development Information (Land acquisition; subdivision, partition, amalgamation, and conversion; new alienation; caveat, lease, easement, transfer; charge and discharge; change of name and address; transmission; trustee; court order; and other registered endorsement).

QRAS Data Base

1. Lot identifiers (I.D.)
2. Lot area
3. Current new rent
4. Arrears as to base year
5. Late fees as to base year
6. Short collection/credit
7. Notice 6A issued
8. Rent classification
9. Amount paid
10. Date of payment
11. Receipt number

TOL Data Base

1. Licence Information (locality; registered use; acreage; and rate charged).
2. Holder Information (name of holder; I.C. number; address; and nationality).

IUL Data Base

1. Locality
2. Registered use
3. Acreage
4. Land use

APPENDIX C. STATISTICAL INFORMATION SYSTEM (SIS), KEVIS

1. Population

   (a) Number of persons, classified by sex and age groups: by marital status; by type and level of education; by ethnic groups; and by district/subdistrict/towns.

   (b) Number of households by size of household.

   (c) Number of live births and death rate: by sex; by age of mothers; by ethnic groups; and by district/subdistrict/towns.

   (d) Number of migrants, classified: by sex; by ethnic groups; and by district.

2. Labour

   (a) Number of persons classified as employed, unemployed, and outside labour force;

   (b) Number of employed persons: by age group; by sex; by industry; by occupations; and by employment status.

3. Household Income: by ethnic groups; by district/strata; per capita income by income group; household income by income group; and income group by kampung.

4. Housing: membership by race; total houses by type; houses occupied by type; residential; average household size; and average number of household.

5. Manufacturing: by industrial group; by number of establishment; by value added and fixed asset; by employment and production by type of industry; and by employment and monthly salary/wages.

6. Government Services: number of employee by category; number of employee by race; number of employee by employment; number of employee by income; and number of employee by qualification.

7. Agriculture: area (size) and number of agriculture holdings, and location of estates by lots.

8. Mining: number of mines, location; value of production; and name of mines and year of lease expiry.

9. Water Supply: sources of supply, reservoirs, and volumes; water production mgd during wet & dry seasons; and water demand, consumption, wastage.

10. Electricity: generating stations and capacities; supply at current capacity and proposed projects; industrial electricity supply capacity; and rural electricity supply capacity and location.

11. Telecommunications:

    a) Telephones - current capacity & facilities (telephone user demand; and immediate and long-term projects).

    b) Postal Services - number of offices (current capacity and service types; and proposed modernization & new projects).

    c) Telex services - types and area (proposed projects & capacities).

12. Education: (number of schools, colleges, universities by types; number of enrollment by levels and types; number of teachers by specialization by sex; location of schools by types by towns and districts; and graduates by universities and specialization skill).

13. Health: (number of public and private hospitals by bed capacity; number of registered doctors, nurses, dentists, paraprofessionals by establishment types; number of hospital admissions and out-patient cases; number of clinics and other local health facilities; and types of epidemic disease prevention projects).

14. Transportation: (number of registered motor vehicles by types; number of public transport vehicles by types; number of establishment of transport companies; traffic flow by road corridors; location and length of roads by classes; railways - routes, passengers, freight volumes; airport - passenger and freight volume & value; and seaport - number of ships, tonnage exported and imported, & value of trade).

APPENDIX D. COMPUTER AIDED MAPPING SYSTEM (CAM), KEVIS

Attributes Data Files (Implementing Stage)	Graphic Data Files

(a). Population
- Distribution by Mukim
- Distribution of Malay population
- Distribution of Chinese population
- Distribution of Indian and others

(b). Squatters
- Location
- Total squatters population
- Distribution of Malay squatters
- Distribution of Chinese squatters
- Distribution of Indian and other squatters

(c). Physical (land use)
- Housing areas
- Industrial areas
- Trade areas
- Institutional land
- Malay reserves land
- Mining land
- Squatter areas
- Forest

(d). Housing
- Location
- Existing housing estates
- Housing projects under construction
- Approved housing projects but not yet implemented
- Housing project submitted for approval

(e). Relocation of factories from Federal Territory
- Location of factories
- Status of factories
- Category and type

(f). Traffic volume
- Location
- Volume

A common geographic coordinate system/unit of analysis

INFORMATION SYSTEM FOR REGIONAL PLANNING IN MALAYSIA

Attributes Data Files (Planning)	Graphic Data Files

(a). Status of land
- Land not expired (T.T.L.)
- Expired land
- Mining land
- Temporary Occupation License land
- Government land

(b). Land use
- Restriction of interest/ Express condition

(c). Malay reserves
- Area by lot
- Express conditions on land

(d). Land application
- SMAT conversion

(e). Cadastral
- Land surveyed by lot

(f). Administration
- Boundaries of state, district, subdistrict, and local government

(g). Election boundaries
- Parliament
- State

(h). Physical
- Forest land
- Agricultural land
- Rivers
- Forest, swamps, and hilly land
- Road
- Rail

(i). Public utilities
- Hospitals, police stations,
- Post offices, mosques,
- Balai Raya, telephones
- Schools

(j). Population
- Distribution by race
- Towns and settlements

(k). Squatters
- Location
- Squatters' houses
- Racial breakdown

A common geographical coordinate reference system/unit of analysis

APPENDIX E. PROJEK MONITORING SYSTEM (PROJEK), KEVIS

A. SOCIOECONOMIC

I. SQUATTERS

a) Railway squatters - squatter areas, action taken by Malayan Railways to prevent squatters.

b) Squatters in Kelang Valley region - by area/no. of families/race, occupations, foreign squatters.

II. HOUSING

a) Delay in implementation of housing projects - by area, units/types/delaying factors.

b) Supply, demand, housing prices, housing developers, and housing schemes.

III. TRADE/COMMERCE

a) Shopping space - by name/location/developer/units/ethnic/activities.

IV. INDUSTRY

a) Relocation of industries from Federal Territory - by types/area to resettle/time frame.

b) Industries by area/types/unit/employment and ownership.

B. PHYSICAL

I. LAND

a) Malay reservation land - by area/land use
b) Federal/institution reserved and alienated land - by area/purpose of alienation/present use of the land.
c) Land development (conversion/subdivision) - by area/types of housing/units.

II. BASIC FACILITIES/PUBLIC UTILITIES

a) Electricity, water and telephones, telex - existing facilities/area/new projects approved and implemented.

b) Educational institution, religious house, cemetery/ health, police, fire brigade and postal facilities, community hall — existing facilities in terms of units/area/approved and implemented projects in terms of units/area.

III. TRANSPORTATION

a) Roads and public transportation system - by area/ units/existing and new roads approved or implemented.

IV. ENVIRONMENT

a) Waste disposal system - existing system/type/area/ existing sites for land field/problems and actions taken.

b) Cleanliness of Kelang/Gombak Rivers - by area/ types and sources of waste disposal/actions taken.

APPENDIX F. PROPERTY INFORMATION SYSTEM (PIS), KEVIS

PIS Data base (Building structure on land)

(a) Civic address together with lot and title no.

(b) Legal and illegal building

(c) Transacted value

(d) Rental and assessment

(e) Floor space

(f) No. of storey

(g) Plot ratio

(h) Physical characteristic

(i) Amenities

(j) Building use and types (residential, commercial, industrial, office, others)

(k) Building size

(l) Tenancy

(m) Ownership

Chapter 10

INFORMATION SYSTEM FOR REGIONAL AND LOCAL DEVELOPMENT PLANNING IN THE METROPOLITAN MANILA COMMISSION

Elena M. Panganiban

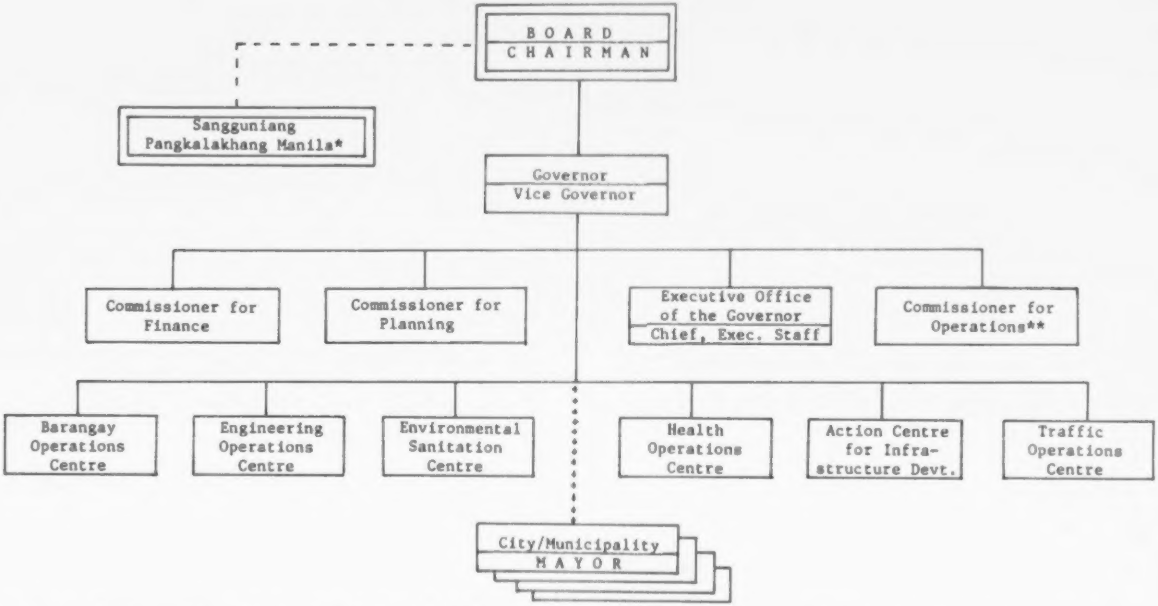
INTRODUCTION

During the decades following the Second World War, Greater Manila grew rapidly in population, activities, and urban scale. The complexity of its problems and needs likewise grew. Increasingly, local governments and national agencies operating within the area proved unable to provide adequate public services and cope individually with their common problems. Although efforts at regional planning and interlocal cooperation were begun, no effective institutional mechanism existed to prepare and implement a coherent development plan and coordinate government services for the capital region on a continuing basis. Problems of urban congestion and sprawl, and associated deficiencies in housing, transport, sanitation, health, police, and other public services thus continued to mount.

In response to this situation, the Metropolitan Manila Commission (MMC) was created by Presidential Decree No. 824 (7 Nov. 1975) as a middle-tier government over the four chartered cities and thirteen municipalities comprising the area.1/ The Commission was empowered to "act as a central government and administer programmes and provide services common to the area" and to exercise legislative, executive, and fiscal powers and functions. The MMC has assumed direct supervision and administrative control of the constituent local governments, whose mayors, vice mayors, and administrative offices have been retained but whose elective councils, though initially provided for by PD 824, were in effect abolished.2/

The Commission is headed by a Governor as Chairman, a Deputy Governor as Vice Chairman, and three Commissioners, one each for Planning, Finance, and Operations (see figure 31). All are appointed by the President of the Philippines. However, the Commissioners were not all immediately appointed, and in 1979, the Governor was given the power to exercise the

Figure 31. MMC organization chart


BOARD
CHAIRMAN
Sangguniang Pangkalakhang Manila*
Governor
Vice Governor
Commissioner for Finance
Commissioner for Planning
Executive Office of the Governor
Chief, Exec. Staff
Commissioner for Operations**
Barangay Operations Centre
Engineering Operations Centre
Environmental Sanitation Centre
Health Operations Centre
Action Centre for Infra-structure Devt.
Traffic Operations Centre
City/Municipality
MAYOR

Source: Management and Organization Service
*Not yet constituted
**Not yet appointed/designated. The Vice Governor assumes its functions in concurrent capacity

▭ Appointive Board or Council
——— Central line of authority
+-+-+ Technical supervision
----- Advisory relationship

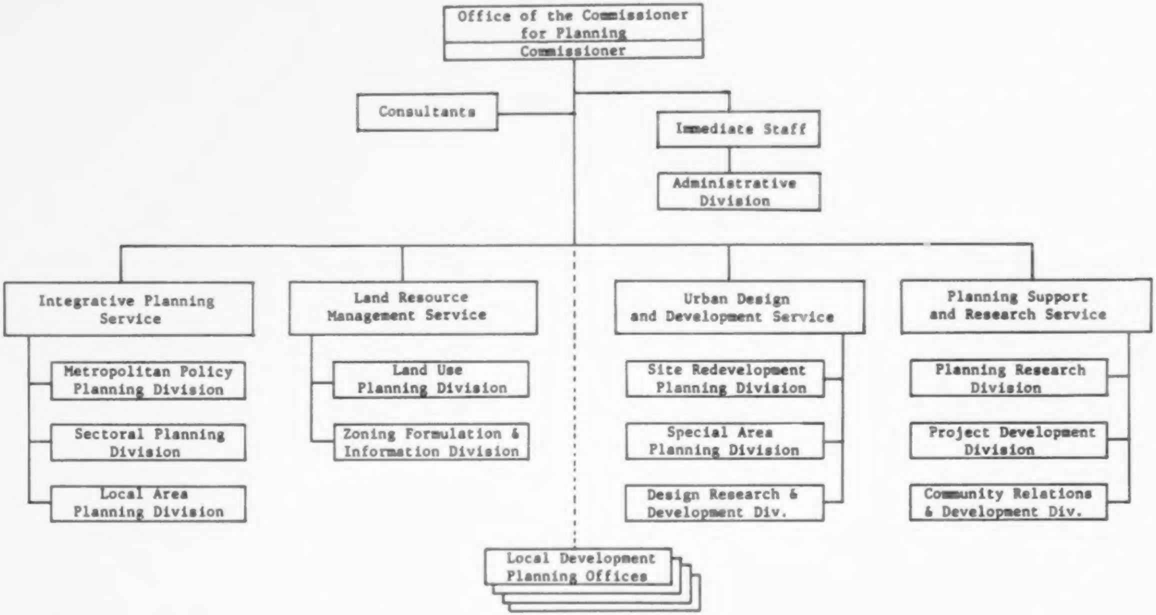
powers and functions of the Commission until the rest of its members were appointed.3/ The Governor concurrently serves as the General Manager and the Vice Governor serves as the Deputy General Manager of the Commission.

Among the powers and functions of the Commission are to ensure that comprehensive, social, economic, and physical planning and development is undertaken and to "coordinate and monitor governmental and private activities pertaining to essential services such as transportation, flood control and drainage, water supply and sewerage, social, health, and environmental services; housing, park development, and others.4/ For these purposes, the Commissioner for Planning shall formulate "long-range plans for the integration of common, essential, municipal, and public services," conduct researches and investigations, and perform other functions necessary for planning, while the Commissioner for Operations shall "maintain a monitoring system" to oversee the execution of or compliance with approved policies and plans of the Commission and perform other related functions.5/

In line with these functions, the MMC and its constituent offices have prepared a number of general and specific plans and have sought to integrate the programme and project proposals and coordinate the activities of national agencies and local governments within its jurisdiction. The MMC took some time to develop and demonstrate its own planning and implementing capabilities. Initially, "Action Officers" seconded from other agencies and institutions were engaged to assist the MMC in planning and coordinating particular programmes. Metropolitan "operations centres" were established for programme activities that the MMC directly assumed or sought to coordinate, i.e., those in health, environmental sanitation, infrastructure development and regulation, traffic operations, barangay activities, and special operations (see figure 31). Most of these offices have their own planning units.

It was only in 1979 that central planning at the MMC was instituted. In February 1979, a Development Planning Office was set up and an Assistant to the Governor was designated to head the office. In March 1979, this was reconstituted into the Office of the Commissioner for Planning (OCP) (figure 32), and the Commissioner was appointed in place of the Assistant to the Governor. Planning continued to be undertaken at the level of the operations centres, and the local governments were likewise expected to contribute to the planning and execution of MMC policies and programmes within their own jurisdictions. Serving essentially as administrative units of the MMC, the city and local governments, aside from performing residual administrative and political functions, were mandated to help implement the integration of services desired and approved by

Figure 32. Office of the Commissioner for Planning organization chart


Office of the Commissioner for Planning
Commissioner
Consultants
Immediate Staff
Administrative Division
Integrative Planning Service
Metropolitan Policy Planning Division
Sectoral Planning Division
Local Area Planning Division
Land Resource Management Service
Land Use Planning Division
Zoning Formulation & Information Division
Urban Design and Development Service
Site Redevelopment Planning Division
Special Area Planning Division
Design Research & Development Div.
Planning Support and Research Service
Planning Research Division
Project Development Division
Community Relations & Development Div.
Local Development Planning Offices

Source: Office of the Commissioner for Planning, *Primer*.

——— Central line of authority
------- General supervision

the MMC and to supply information required by the MMC to effect such integration.6/

Starting with a "structure plan" for the metropolitan area in 1976, the MMC has since also prepared a Regional Development Framework Plan (RDFP), 1983-92, a Capital Investment Folio (CIF) for 1983-87, and a series of sectoral programme plans consolidated and most recently revised for 1984. In addition, five of the local governments within the area have prepared and submitted parts of their development plans for their respective jurisdictions in compliance with MMC planning directives and guidelines. In 1977-78, the MMC had also prepared land use plans and adopted a zoning ordinance for the metropolitan area and its localities.7/

As might be expected in view of the size and complexity of the capital region and its intimate relations with the nation and the outside world, considerable problems have been encountered in the implementation of the MMC's plans and programmes. Delays in the completion of major projects, such as those in transport and traffic, bear evidence to the difficulties faced by the MMC and related agencies as well as the massive efforts being attempted by them. These problems are partly due to adverse economic conditions, which are apparent, for example, in the financial constraints confronting the completion of the light rail transit project in Metropolitan Manila. In part, however, they may also be traced to the technical and institutional intricacies and costs of planning and implementation in a modern-day metropolis in a developing country -- factors which make even the updating of existing plans a difficult enterprise.

The approaches and techniques of urban and regional planning have had to grow in sophistication to match the scale and complexity of the development and operations required by contemporary metropolises, which must attempt to simultaneously fulfill needs and demands for economic efficiency, social equity, and environmental quality. Unlike before, when simpler "master" planning procedures seemed sufficient, planning systems today must be more open and more finely attuned to the larger social systems that they are trying to comprehend and regulate. Thus, planning concepts and processes must incorporate more dynamic models that continually refer to and reflect the changes that occur in the real world, particularly those induced by the implementation of plans themselves.8/

Among a number of requisites, regional planning needs an adequate information system to serve as an effective guide for articulating the goals and means of development, implementing policies and programmes, and monitoring, evaluating, and controlling their impact. This case study is concerned with the information system available for planning and development administration in Metropolitan Manila. The following sections describe and analyse the information needs suggested by the major plans prepared by the MMC, the information base used, its sources, and its various users, and the manner in which the information system has been organized and managed for planning, monitoring, and evaluation purposes, and its key problems and prospects for improvement.

This report will initially assess the MMC's information needs on the basis of its first "structure plan." It will then begin to analyse the information actually used by the MMC for comprehensive planning as reflected in its 1982 "framework plan." Subsequent sections deal with the information base, processes, and organization for formulating and reviewing the MMC's capital improvement "folio," internal programme plans, and local government plans. Finally, key features for the existing information system are recapitulated and analysed.

INFORMATION NEEDED AND USED FOR GENERAL PLANNING

Information Needs: "City of Man"

The plans prepared by the MMC have called for an extensive and intensive information base. Nominally, at least, it has approached metropolitan development and planning from a comprehensive perspective, as suggested by its 1976 structure plan entitled, "Manila: Toward the City of Man." This plan aimed "to remake a decaying metropolis" into one that would provide a better quality of life for its inhabitants through the following strategic measures: improvements in environmental conditions and settlement patterns; expansion of the potential of its commercial, financial, and industrial areas for economic development and employment generation; improved accessibility through new road links between the area and its hinterland and within Metropolitan Manila itself; more rational allocation of land and control of sprawl through better use of existing sites, rehabilitation or expansion of existing facilities, and provision of sites for housing, institutional, and open space uses; and integrated development through the participation of all sectors, coordination of public services, and establishment of priorities for public and private investments.9/

Although "City of Man" expressed familiar planning concerns, it was billed as a "decision document" that presented definite ideas regarding certain issues facing Metropolitan Manila, such as the high concentration of schools and universities at the core, the desired pattern of urban development, and the various projects envisioned for improving public utilities and social services. The plan showed a wide range of concerns for what were later to be officially identified as "the eleven basic needs of man,"10/ a theme advanced on a nationwide basis by the Ministry of Human Settlements. Still, the structure plan11/ was for the most part a general statement, incorporating specific proposals in summary fashion within a slim volume of sixty-two printed pages. Moreover, it showed very little of its information base. Most of this base had probably been developed in previous regional planning projects by national agencies, such as the Manila Bay Region Strategic Plan (1976), MMETROPLAN (1977) for transport and traffic, and the designs for various other projects of a more sectoral kind. The structure plan presented demographic, socioeconomic, financial, physical, and other types of data only in summary or schematic fashion, often in the form of maps. Its time-frame may be inferred only from its demographic charts,12/ which do not even correspond accurately with the percentages cited in the text.13/

While its authors described it as a decision document, "City of Man" was at the same time "a first approximation."14/ They implicitly acknowledged that it was based on inadequate information. "However, as more planning information is obtained and deeper analysis of the metropolitan system and subsystems becomes possible," the plan would be refined in terms of sectoral, population, and employment targets and project priorities and phasing.15/

The RDFP's Information Base

In 1982, the MMC came up with the Regional Development Framework Plan. This proceeds on much the same basic theme as "City of Man," and purports to serve the same function of being "the basis for the formulation of more detailed local plans and line agency programmes."16/ But the RDFP differs from the earlier structure plan in certain formal and substantive respects. Aiming mainly at economic growth, improved quality of life, and a better urban structure, the document presents its observations and proposals in a more straightforward and "even-handed" manner on various elements of metropolitan development (in numbered topical sequence). Unlike "City of Man," the RDFP includes a brief historical background, a description of the area's physiographic, land use, and environmental conditions, and a statement of Manila's institutional framework as well as financial base (see Appendix A). Its policy, programme, and project proposals and targets are somewhat more specific, with an explicit ten-year plan period.

Moreover, the RDFP presents more quantitative data, although these are also often shown in aggregative and graphic forms. Indeed, one of the objectives of the Framework Plan is:

> To provide a single picture of the future, one set of socioeconomic and development objectives, and a common data base to be used by all national, metropolitan, and local government agencies in the preparation of projects and programmes.17/

Thus, the RDFP gives a better idea of the kinds and quantity of information needed and used by the MMC, though its quality and manner of use may be another matter. The main data categories are those on Metropolitan Manila's physiography, environment, population, economy, infrastructure and utilities, and social services. Quantitative data on these various elements, including projected demands and financial requirements, are presented in twenty-eight tables. There are also fifteen maps and six charts in the 164-page volume (printed, single-spaced).

All in all, the RDFP's data base is extremely limited for a comprehensive plan, with some of the basic information being either too aggregative or missing. Moreover, most of the quantitative data included in the plan document were derived from secondary sources, except for some projections and proposals made by the MMC itself. Only ten of the twenty-eight tables pertained to existing and/or past conditions; the rest were forecasts or prescriptions.

No effort was taken by the MMC to generate original data on current conditions as a common baseline for general planning. Other local jurisdictions are usually required to conduct surveys and to report their results in "socioeconomic profiles" as a basis for planning, and the MMC itself requires its constituent local governments to prepare such profiles. The reason that the MMC did not do the same for the RDFP was probably the fact that the results of the 1980 Census and related surveys had just been reported at the time that the RDFP was begun. Previous regional, transport, and "sectoral" planning projects had also supplied usable data, and consultants' work on the MMC's Capital Investment Folio, which was prepared simultaneously with the RDFP, also contributed some new information.18/

Nonetheless, the reliance of the RDFP on secondary sources resulted in some unevenness in its baseline data; while some tabulated data were obtained in 1980, others covered years or periods earlier or later than 1980. Some data sets seemed to be of sufficient importance to merit updating. The total population of Metropolitan Manila, for example, was later reported by the MMC to be much larger than the 1980 census figure (8.2 million during regular school months vs. the 5.93 million reported by the 1980 census). Yet no attempt was made to ascertain or publish the details of the larger count, much less use them for planning.19/ Similarly, the text of the RDFP cites the in-migration rate for 1970-75 (28 per cent of the increase in population), but not for the subsequent period.20/ It expresses concern that Metropolitan Manila "had the worst pattern of income distribution" among all regions in 1975, but presents or cites data only for that year.21/

RDFP's Physiographic Data

In some respects, the RDFP shows good use of the information available, but in others it is superficial at best. For example, physiographic information appears to have been ably synthesized with information on man-made activities and facilities to determine regional structure, identify problem areas, and indicate directions for future urban growth, including the cost constraints and the rough order of priority for growth areas.22/ However, no sufficient detail is supplied to enable users of the RDFP to judge for themselves the soundness of the Plan's basis for its proposals. A sizable reclamation area on the Manila Bay shore, which was originally intended for an ultimate population of 10,000, is identified as too costly to build on, but no cost information is given by the Plan and it is unclear as to that project's priority rating.23/

RDFP's Demographic and Socioeconomic Data

Despite apparent efforts at greater precision and analysis regarding demographic and socioeconomic conditions, the RDFP leaves much to be desired in terms of quantity and quality of data. Demographic data are treated in sometimes cavalier fashion. Inconsistent growth rate figures are cited.24/ Past growth rates and density figures are presented on maps as well as in the text,25/ but their numerical basis is not given. Population projections are shown in only one brief table26/ and these are expressed only in regional27/ (i.e., metropolitan) growth rates (per cent) for 1983, 1987, and 1992. The rates for intervening years, and their numerical equivalents and distribution by locality, are not given. Thus, the Plan has no common and authoritative set of population projections or targets for its various elements. Subsequent sections present estimates of population and demand for different facilities and services on the basis of projections made by previous studies.

The RDFP presents or cites more quantitative data on socioeconomic conditions and analyses some of these by sector. Still, there remain serious gaps in data, analysis, and inferences. The Plan notes, for example, that nearly 73 per cent of all establishments in Metropolitan Manila (47 per cent in manufacturing) were in the "informal sector" in 1975,28/ but no later figure on this significant point is cited. The Plan presents employment data for different sectors in 1978 and 1979,29/ but the 1979 data on manufacturing, which had the biggest shares of employment (nearly 36 per cent in 1978) and unemployment in the region, are missing in the Plan.30/ Some socioeconomic data sets are combined and mapped or graphically presented, but again often at the sacrifice of important numerical detail. The number of unemployed persons and job vacancies for three years (1978-80) for instance, is charted in the Plan,31/ but this chart is difficult to interpret accurately without the corresponding numerical data.

As in the case of the demographic aspects, it is hard to determine the extent to which the Plan's economic projections and proposals were informed by the socioeconomic data. The projections are minimal and cryptic. The projected growth rates of the Gross Regional Domestic Product are disposed of in one short sentence,32/ and the projected employment and unemployment rates (in per cent and thousands, for 1983, 1985, 1987, and 1992) are also contained in one table.33/ These are all expressed in regional aggregates, and the Plan does not explain their assumptions, show their implications for the different localities and sectors, or relate them to its policy, programme, and project proposals. Neither are the results of analysis in previous sections brought explicitly to bear on the Plan's recommendations. Thus, one may also raise questions of consistency between, say, the observed preponderance of the informal sector and its potential for development, on one hand, and the Plan's primary proposal to promote "large-scale, organized commercial activity," on the other.34/

RDFP Data on Utilities and Facilities

More complete and current data on infrastructure facilities, utilities, and social services are presented and analysed in the RDFP. Here the Plan evidently had more secondary sources to draw from in the form of previous planning and agency reports. These had yielded their own demographic, socioeconomic, and related premises and forecasts or targets, and these could be more closely associated with specific facility and service proposals. Thus, the RDFP has more quantitative data to show regarding past experience in and future demand for water supply, and does likewise with the financial investments required by transport, water, sewerage, flood control, housing, and other projects. Still, the analyses and projections are not performed with any degree of consistency in all sectors. No projection is made of future transport demand.35/ Housing projections are shown in regional aggregate for 1983 and 1987 alone, and only the number of new units required is singled out for attention,36/ although the Plan is equally concerned with upgrading slums.37/ It presents and analyses a great deal of data on sewerage,38/ but shows very little on solid waste management, one area of environmental sanitation for which the MMC had assumed direct responsibility.39/ Throughout the document, only the forecasts for power sales are disaggregated by locality.40/

RDFP's Land Use and Zoning Data

The RDFP also utilized data generated by the other offices within the MMC, foremost of which is the land use and zoning information. They are deemed important for the framework plan in order to preclude indiscriminate land use mixes due to unrelated, unregulated, and uncontrolled land uses, which in turn cause hazards to public health, life, and properties, inefficient distribution of public facilities, and misuses of environmental and human resources. In short, the data on land use and zoning aim to achieve a development framework which will define and regulate the uses of land over a certain period of time.41/

Land use and zoning information is generated, processed, and made available by the Land Resource Management Service (LRMS), one of the four service units of the Office of the Commissioner for Planning (see Appendix B). The office makes use of administrative records, i.e., applications for "locational clearances,"42/ as part of a regulatory procedure which is required of proponents of building or other physical development projects. The LRMS is now taking steps to establish a computerized data bank which would include an inventory of establishments by city/municipality partly on the basis of such locational clearances.

Of all the planning subsystems of the MMC, the LRMS has to make extensive use of mapped information as another form of input into its land use and zoning functions. Several types of maps have to be prepared and made available in order to formulate and update land use plans and zoning regulations. Some kinds of maps which are needed are still to be developed; for example, cadastral maps (1:5,000), barrier maps, and aerial photo (1:10,000).

Actual field investigations which are undertaken by the staff regularly, or as the need arises, include "foot," "windshield," or "felt" observations. It is only recently, however, that a survey of idle lands has been initiated as a result of an urban land management study funded by the World Bank as part of a bigger project.

The results of investigations and surveys serve as inputs into the existing maps or plans for proper changes. Likewise, their processing and analysis have been very simple. So far, the LRMS has only employed purely historical data and development trends with no attempt to use sophisticated models at all.

A monitoring map facilitates the process of monitoring and evaluating compliance with existing zoning ordinances by the projects being proposed or approved for an existing area. This map is backed up by index cards containing information on, among others, the existing land use based on surveys and the land use classification as to zoning. Continuous, almost daily, updating of this information base is intended to facilitate the job of evaluating and revising the plan.

The LRMS under the OCP processes the various applications for locational clearances of proposed development projects within Metropolitan Manila in coordination with the Human Settlements Regulatory Commission and with the local governments. Recently, a separate office of the Metropolitan Manila Zoning Administrator (MMZA) has been created by virtue of Executive Order 81-06 and this is now concurrently held by the Commissioner for Planning. He has the power to monitor all projects granted locational clearances, variances, exceptions, temporary use permits, and special permits. All local government zoning administrators who are under the administrative and technical supervision of the MMZA are empowered to monitor all other projects not covered by the MMZA. The MMZA is also the overall chairman of the Local Zoning Review Committee which is entrusted the duty of reviewing the Ordinance every year or sooner when the need arises. The other members of the Committee include the Local Zoning Administrator, and representatives from the Human Settlements Regulatory Commission, MMC Commissioner for Planning, MMC Commissioner for Finance, Office of the Mayor, and private sector.

Weaknesses in RDFP's Secondary Data Base

The deficiencies in the RDFP's data base, analysis, and projections are traceable to its dependence on secondary sources, which are not always forthcoming with the same kinds, quantity, and quality of data. Like other agencies, the MMC must normally rely on the National Census and Statistics Office (NCSO) for more complete and common demographic and socioeconomic statistics which are also comparable with data for other regions. NCSO censuses and surveys, however, are done only periodically -- the population census every five years, and the economic census and household income and expenditure survey at different intervals of shorter or longer duration. Moreover, their results do not become immediately available. The 1980 census results were released only in 1983. The results of the last economic census, undertaken in 1975, were published in

1978; the latest such census (1985) has not even started. There are several reasons for these delays. One is the inadequacy of qualified manpower in the NCSO, which has experienced rapid turnover and difficulties in recruiting replacements particularly for those handling the computer equipment. Another may be political in nature, since new NCSO statistics may figure in controversy over population-based local political status or claims for national aid, or over trends in income distribution.

Gaps in NCSO statistics or delays in their release are typically compensated for by agency estimates or special surveys. Intercensal population estimates, for example, may be obtained from the Ministry of Health. A National Demographic Survey has been completed and released by the University of the Philippines' Population Institute in 1968 and in 1973. The 1983 survey is now in the data processing stage.

Surveys and studies by other institutions, scholars, and consultants have also generated supplementary data. But one problem often encountered is that the results may be widely divergent or conflicting due to variations in coverage, definitions, and methods used in different surveys. Already present when the same agency changes its definitions of, over time, say, urbanization or literacy (as the NCSO has done over the past few decades), this problem is aggravated when different agencies use different sampling methods or cover varying aspects of the same topic. The MMC has sought to minimize the impact of this problem by relying on what it thinks is the most competent source for each data set.

In addition, in preparing the RDFP the MMC consulted with different government agencies and institutions involved in or concerned with Metropolitan Manila. A conference with representatives of these agencies was held on 15 January 1982 to review the Plan,43/ although it is not indicated whether it was revised or modified as a result of that meeting. What the document does say is that all government and private entities concerned should follow the goals of the Plan, and that "The RDFP is a continuing process. It is updated annually upon consultation with national agencies."44/ Actually, however, the Plan may be said to have been updated only in terms of specific programme and project proposals, not in its entirety.

THE CIF PROCESS

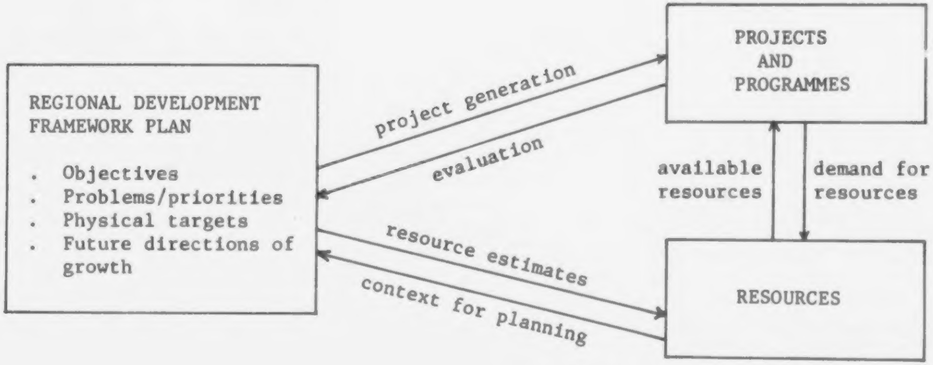
The MMC's information system will also be assessed in terms of its Capital Investment Folio. This document was focused on Metropolitan Manila's physical capital requirements and programmes, and it had the benefit of the services of a planning consultant as well as the results of previous sectoral studies and agency reports. Thus, it is likely to have been underpinned by a more adequate data base. In fact, the CIF probably had a common base with the RDFP. The RDFP is supposed to have been an input into the CIF, but they were actually prepared at about the same time and the CIF also served as an input into the RDFP. Moreover, the CIF left a clearer record, in the form of a series of "working papers," of the process that produced the final document. Thus, one can get additional insights from the CIF into the information system that underpins MMC planning.

The "CIF Process," indeed, had been started in 1978 in the Ministry of Public Works, which produced folios for 1979 and 1980 and then turned over the responsibility for preparing them to the MMC's Commissioner for Planning.45/ The CIF for 1983-87 was prepared by Halcrow Fox and Associates of London starting in January 1982 and was submitted as a "study report" to the MMC in November 1982. The *Final Report* is a much thicker volume than the RDFP; its 175-page text is supplemented by more illustrative material, including photographs, charts, and diagrams as well as tables. It is essentially a schedule of ninety-three committed or proposed infrastructure projects or packages of projects and their corresponding cost estimates. Most are or were projects of three national ministries (Public Works and Highways, Transportation and Communications, and Human Settlements), with only the proposed, World Bank-financed "Urban V Package" listed directly under the MMC.46/

Data Components and CIF Working Papers

According to the CIF *Final Report*, there were three major inputs into the CIF process — "the RDFP, the estimates of available resources, and the agencies' projects and programmes"47/ (see figure 33). Due to the timing of the preparation of the RDFP and the CIF, however, an "interim planning framework" instead of the (yet-to-be finished) RDFP was used for the CIF, although the RDFP was intended to be used in the future annual reviews and revisions of what was to be a "rolling" five-year CIF programme.48/ Thus, most of the quantitative data embodied in the *Final Report* are financial, in line with the view that the CIF "should be viewed as the financial representation" of the RDFP.49/ Although there is a brief recapitulation of Metropolitan Manila's problems and the MMC's development goals and policies, the only other data sets presented in the CIF report are those on problem areas, population distribution (1980), and income distribution, and these are in the form of maps and schematic charts.50/

Figure 33. Linkages between the three major inputs of the CIF process


REGIONAL DEVELOPMENT FRAMEWORK PLAN
. Objectives
. Problems/priorities
. Physical targets
. Future directions of growth
project generation
evaluation
PROJECTS AND PROGRAMMES
available resources
demand for resources
resource estimates
context for planning
RESOURCES

Source: CIF Final Report, p. 36.

The information base of the CIF might have been more extensive than the Final Report shows. As previously mentioned, a series of working papers (twenty-five in all) were developed by the CIF team. Of these, seventeen were concerned with the specific natural and social conditions and public facilities for which data were needed and which were reflected in varying degrees in the RDFP's categories. Yet the working papers are brief, tentative documents that are uneven in the quantity and quality of data they contained.

The working paper on population, for example, has far more numerical data than the RDFP and the CIF Final Report itself embodied. These include tabulations of population, population change, and other demographic indices (average annual increase and per cent growth rates) by locality and year, as well as maps of population growth (1960-70 and 1970-75) and a chart of 1980 population by age group. But only one table is devoted to population projections, and these projections are in aggregates for Metropolitan Manila, albeit by year (from 1980 to 1990) and in number of persons and per cent growth rates for Metropolitan Manila and for the nation. Moreover, at the very outset, the working paper recognized the following problems in the demographic data base:51/

> the reliability of recent census and subsequent population projections has been questioned;
>
> barangay counts, which amongst other things are used as a basis for allocating funds, tend to be significantly in excess of the census population;
>
> there have been delays in the publishing of census data;
>
> difficulties have been experienced in obtaining clear definition of the areas for which data has been collected; and
>
> some government agencies base capital investment programming on their in-house population forecasts.

The working paper on transport52/ was gleaned mainly from two previous planning studies, MMETROPLAN53/ and MMUTIP54/, undertaken in 1977 and 1981, to analyse current transport problems, including traffic congestion and the supply and performance of public and private transport modes. Quantitative data are summarized in the text and in two maps showing congestion levels and bottlenecks.55/ Since MMETROPLAN, "little has changed,"56/ but parallel findings in MMUTIP do show that some problems had found some relief (e.g., increased bus supply),57/ while others had grown worse (30 per cent increase in number of private cars).58/ No trend data, however, are shown or cited on the problem of pedestrian welfare, and road accident figures are not up to date (1975 and 1976 only).59/ Moreover, the working paper is satisfied to reproduce MMETROPLAN's forecasts of future transport demand (1971 actual, 1976 estimates, 1980 and 1990 forecasts) as "still relevant,"60/ though MMETROPLAN's population forecast for 1980, 6.7 million, far exceeded the 1980 census figures (5.9 million).

The rest of the transport working paper provides an informative review of various transport and traffic projects, including road construction, the light rail transit, rail, bus, airport, and port projects.61/ Their worth and progress or lack of progress are briefly assessed, e.g., the continuing need for "cordon pricing" and the lack of action on this MMETROPLAN proposal.62/ The information base on these projects seems to be ample; at the outset, the working paper "assumes that the details of the transport system in Metropolitan Manila are known."63/ However, the data on existing conditions and problems and on future demand for transport services appear to be deficient.

Financial Data

The CIF Final Report itself contains mostly financial data. The tabulated financial data include those on government direct64/ capital expenditures in previous periods (from 1977 onwards), "low" and "high" projections of financial resources over the next period to 1987, and the recommended expenditure programme for the proposed projects. These data are in millions of pesos and in current and 1982 prices, and are broken down by agency, jurisdiction, and/or programme or project. There are separate tables for national agency and local government programmes, including, in two tables, the past income and projected resources as well as capital expenditure of the MMC and its constituent localities.65/

The data on past income, expenditures, and committed or proposed projects were obtained from the national agencies and local governments concerned. The CIF team, jointly composed of the consultants and the MMC planners, reviewed and evaluated the committed and proposed projects, their relative priorities, and their cost implications against available resources. The different projects were reviewed in substantial and technical terms, and they were tentatively grouped into "first" and "second" priority projects on the basis of their likely response to changes in economic growth and personal incomes.66/ But the financial criteria remained dominant, particularly at the intersectoral and aggregate levels. The team found that the expected costs of the committed projects were so overestimated by their proponents that they far exceeded available resources and left little room for new projects. Thus, it recommended alternative "scenarios" to deal with "low" and "high" resource contingencies.

Data Improvement Needs

Most of the CIF report's contents are in the form of recommendations and guidelines for future application of the "CIF process." It recommends elaborate criteria and procedures for monitoring and evaluation, including the reporting forms prescribed, but these were used in an exploratory fashion, if at all actually applied, for purposes of the Final Report. In other words, it appears that this document was not placed on a firm data base. As it notes, "The collection of reliable information about projects and programmes has proved difficult .... It is basic to the future success of the CIF for without it there can be no meaningful assessment of the demand for resources either in total or by sector."67/

Thus, "data base development" was one of the CIF Final Report's recommendations. This required specification of data needs for planning by participating agencies, production in disaggregated form of data sets, establishment of procedures for data storage, updating, and processing (including computerization), and land use mapping based on 1982 aerial photography and the MMC's newly-acquired 1:25,000 coverage.68/ In addition, area planning studies,69/ special sector reviews, and private sector studies should be conducted.70/ The report also prescribed the organization of an Interagency Technical Working Group (IATWG) and a Technical Secretariat (headed by MMC Commissioner of Planning) to conduct annual reviews and recommend revisions in the CIF 71/ and, in effect, to serve as the operative links among the MMC, national agencies, and local governments in the updating of the CIF and the RDFP. The MMC (Technical Secretariat) could "act as the catalyst for improved information flow" between the national agencies and local governments.72/

An accompanying CIF Manual issued on 7 November 1982 also prescribed the reporting forms needed for annual monitoring, evaluation, and revisions of the basic plan documents. These forms, however, are limited for the most part to project information for project monitoring and planning evaluation. An elaborate set of evaluation criteria and reporting/monitoring forms were recommended. Although the data requirements of these criteria were identified, they were not always specified precisely as project cost categories (e.g., what was meant by "high" or "low income" in the analysis of equity impact?).73/ Methods and standards of research and analysis were also not identified or specified.

If these prescriptions were "good enough" to guide subsequent phases of the CIF process, the questions would be, To what extent have they really been followed in practice? Who have used the CIF Final Report, the RDFP, and their data base development prescriptions?

The CIF is now in the process of being revised. It is not yet clear that the proposals or prescriptions are being carried out, as indicated by the first CIF Annual Report (issued in 1983, covering the period 1984-88). This report represents an effort to incorporate somewhat more quantitative data on existing conditions (brought up to 1983), and these are briefly analysed or summarized in connexion with the blight, flooding, water, traffic, sewerage, and sanitation problems of Metropolitan Manila. The "planning framework" section in which these problems and the development proposals of the report are contained, is ahead of all but the executive summary — a change in sequence from the CIF Final Report which buried this section in the middle of the volume. The 1983 Annual Report also drops the methodological sections of the 1982 Final Report.

Otherwise, the former is similar to the latter in terms of emphasis, sequence, and data base, which is mostly financial and project information. The tables and illustrative materials (except the photographs) are replicated though updated, and many of the main findings and even the language of the 1982 report and working papers are repeated.

Some steps toward data base development, however, have been initiated. As part of the CIF process, for example, a Metropolitan Manila Physical Survey (MMAPS) project has been proposed under the MMINUTE Programme of the Ministry of Public Works and Highways (MPWH). In accordance with the Memorandum of Agreement between the Ministry and MMC, dated 1 March 1983, the responsibility of implementation has been transferred to MMC. The bidding for the contract has started, with a number of foreign firms or consultants participating and the funds coming from World Bank Urban III loan proceeds. The work is about to commence which would include a comprehensive inventory and mapping of existing infrastructure, utilities, social service facilities, public and private enterprises, and land value.74/

Data Collection and Analysis: Prescribed Forms and Procedures

The existence of a system, such as that of the CIF, does not always ensure adequate access to data. However, the presence of an Interagency Technical Working Group composed of MMC and national representatives provides a good forum for information exchange about new projects relevant to the CIF.75/ In practice, individual and personal contacts are important in operating the information links between the CIF team and the officials within the different sectoral agencies.76/

Nonetheless, a formal reporting structure has been prescribed for the CIF in order to facilitate and systematize the collection of all types of information. According to this prescribed system, both the implementation data and monitoring/evaluation data are to be reported in the following CIF forms: Project Cost and Funding Form (figure 34), Project Information Form (figure 35), and Quarterly Project Status Report (figure 36). The Technical Secretariat has the task of closely coordinating with the agencies and where necessary provides assistance in filling out the forms.

As outlined in the CIF Final Report, the following are the detailed procedures:

As early as the pre-feasibility stage, before resources are finally committed to feasibility study, information is obtained as to practicability and desirability of projects on the basis of judgment backed by "rough" analysis which emerges in discussions and meetings.

After the pre-feasibility study, the Project Information Sheet is completed by the line agencies and submitted to the CIF Technical Secretariat. The Secretariat reviews the information provided with the appropriate line agency and the new project is then scheduled for discussion at the IATWG.

Feasibility studies are then normally carried out for projects which have been shown to be compatible with the objectives of the MMC. Following these, the Project Information Sheet is updated and the project rationale is reviewed by the IATWG. Project prioritization is completed by the line agency within the relevant sector leading to project programming within the five-year period.

For all programmed projects, the Project Cost and Funding Form is completed by the line agencies. This form is updated annually.

Projects are periodically monitored through the Quarterly Project Status Report submitted to the CIF by the agencies at intervals of four months. The percentage of return of this particular report by agency (not by project) is about 75-80 per cent.

Data in the above reporting system, which includes primarily implementation and monitoring/evaluation data, come from the line agencies which are the main proponents of the programmes or projects. These are usually contained in the CIF

Figure 34. Project cost and funding form

Project: ______________________________ Implementing Agency: ______________________________
Total Cost: ________________ Project Status: ________________ Implementation Period: ________________
Contact Person/Position: ______________________________ Date Form Completed: ________________

Cost Item	Total	Expenditure (₱000's)									Data Sources and Assumptions
	Cost	Up to end	Actual	Projected							Pre-Development Costs
	(₱000's)	1980	1981	1982	1983	1984	1985	1986	1987	1988 & beyond	
Pre-Development Costs											
Development Costs (Base)											Development Costs (Base) [Projected Cost in _____ Prices]
Land & Property Acquisition											
Civil Works											
Equipment											
Others											
Sub-Total (Base Costs)											
Design & Supervision											Design & Supervision
Physical Contingencies											Physical Contingencies
Price Contingencies											Price Contingencies
Total Development Costs											
Total Project Costs											
Funding Source Foreign											Funding Source Foreign
Local											Local

Figure 35. Project information form (new projects)
CIF Form 02

Project: ____________________ Proposing Agency: _______________
Project Status: _____________ Contact Person/Position: ________
Stage in Project Preparation: _________________________________
Implementation Period: ______ Date Form Completed: ____________

A. PROJECT DESCRIPTION

1. Technical Objectives and Description (attach plans)

2. Related Projects (show on plan)

3. User Charges (if appropriate describe method of charging users and charging policy)

4. Sources of Information about the Project (list all relevant references)

B. PROJECT PERFORMANCE AGAINST STAGE 1 EVALUATION CRITERIA

5. Feasibility

   a. Is project timing dependent on other projects (describe)
   b. What land/property acquisition is required and what problems are foreseen
   c. Other relevant factors (actions required by other agencies, political factors, technical feasibility)

6. Compatibility with Regional Development Framework Plan

   a. Impact on existing problems
   b. Compatibility with future physical development of Metro Manila
   c. Has project been evaluated using the RDFP data base

7. Impact on Equity

8. Economic Viability - attach economic analysis

   a. Summarize results
   b. How robust are results to changes in key parameters

9. Financial Viability

   a. Summarize sources and application of funds
   b. Does project meet agency's corporate objectives
   c. Is project affordable by its beneficiaries (if appropriate)

Figure 36. Quarterly project status report

CIF Form 03

Date ______________

Quarter under Review ______________

Implementing Agency ______________

Project Title/Location ______________

Project Status
- Ongoing
- Detailed Engineering
- Feasibility Study

Date Started ____________

Completion Date:

Original ______________

Revised ______________

Physical Progress

Gross Accomplishment (%)

This Quarter

To Date

Target/Scheduled Accomplishment (%)

This Quarter

To Date

Slippage (%)

Problems/Causes of Delays

Remedial Measures Taken

Financial Status

Expenditure Codes	for quarter under review Actual	for the next quarter Projected
01 Personnel Service	₱	₱
02 Maintenance Expenditures		
03 Equipment		
04 Others (Specify)		
Total	₱	₱

Actual Expenditures to Date ₱

Balance ₱

Total Project Cost ₱

Remarks

Certified Correct

Printed Name	Signature	Designation	Agency

Annual Report in the form of summary tables, graphs, and simple projections based on alternative assumptions on the rate of economic growth. Sophisticated techniques are rarely used and reflected in the Report but interviews with MMC planning officials reveal that some, e.g., economic base models, are also used at the MMC level.

Almost 95 per cent of the data collected through the CIF process is actually used in plan-making for the metropolitan region. Data collection is undertaken on a regular basis, that is, either quarterly or annually, primarily because they serve as inputs into the preparation of the Annual Report submitted to the Development Budget Coordinating Committee of the National Economic and Development Authority (NEDA/DBCC),77/ the Office of Budget and Management, the Ministry of Finance, the participating agencies, and local governments, and for use in the overall national resource allocation system.

Data Processing

All types of information obtained through the CIF process used to be processed manually. The data handled by the OCP staff were all stored in documents. The problem, therefore, involves the design of systematic procedures for the efficient storage, retrieval, and transmittal of documents containing planning data.

Recognizing the need for a computer system, the Integrative Planning Service (IPS) of the OCP has submitted a proposal for the design and implementation of an information system for general use of the various units of the OCP and for specific application to the CIF project. The proposal involves three stages: Document storage and retrieval stage (two years); Data storage and retrieval stage (two years); and Data support stage (one year).

At least initially, the proposed information system should be able to provide users with information about which documents are relevant to their needs and where these documents can be located. The library system is the model being adopted for the purpose. Its major components, as embodied in the design, are the following: (a) storage media, for the physical storage of documents; (b) human indexer, who will describe the content and location of each stored document, using one index record for each document; and (c) index file, a physical collection of index records.

The design also establishes the format for describing and classifying documents in terms of physical and conceptual classifications. Physical description is deemed necessary to ensure that similar types of documents are physically stored together in one location for easy access. Conceptual classification would indicate not only the contents of the documents but also similarities in content among the documents.

From this simplest operation, the system is expected to progress in five years' time to a decision support system wherein it would be possible to graft the data base system into policymaking decision models, e.g., econometric models and simulation models.78/

The computer for the above purpose has been installed recently. In addition, as part of the MMAPS project, a computerized data bank and an automated mapping system will be established by digitization of topographic, geographic, infrastructure, and utility data.79/

Monitoring and Evaluation

Ongoing projects in Metropolitan Manila used to be monitored by the NEDA and, outside the National Capital Region (NCR), by the Project Monitoring Staff (PMS) under the Office of the President. The PMS has now extended its monitoring activities to include the NCR. Neither of these sources, however, has been tapped for CIF monitoring and evaluation purposes. The possibility of using them in order to avoid duplication of existing monitoring exercises which influences the quality of data provided by the agencies is yet to be looked into by the CIF.

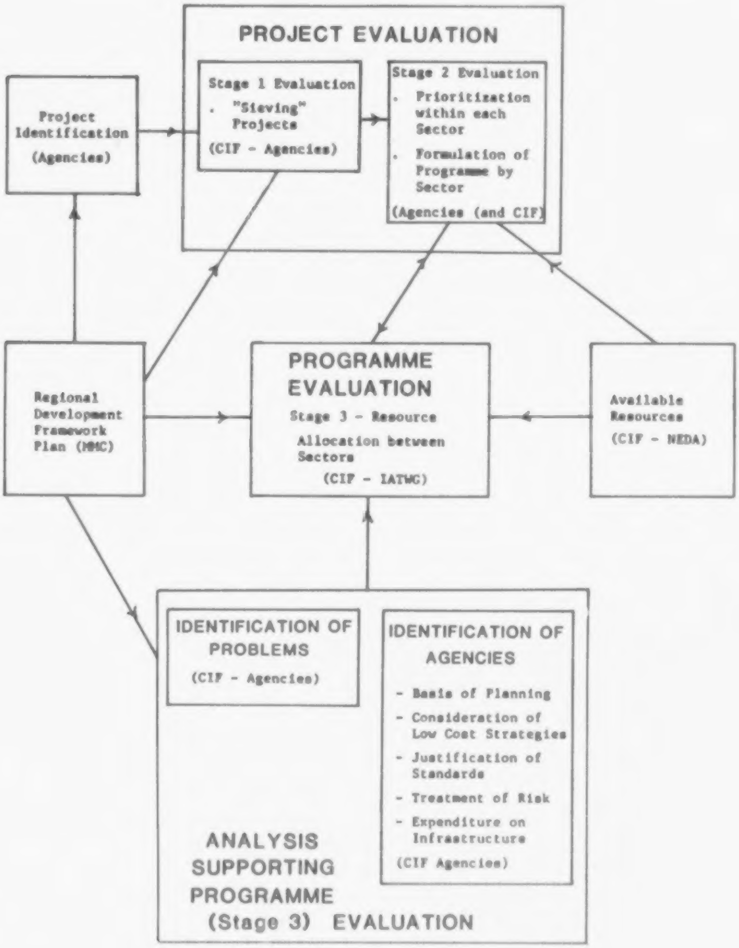
For CIF purposes, the Technical Secretariat is the office which is supposed to perform monitoring functions. Monitoring data are obtained by the Secretariat through the CIF Project Status Report Form (figure 36) submitted quarterly and furnished to PMS. This used to be the report on Project Physical Monitoring but was changed to Quarterly Project Status Report in order to incorporate not only the physical progress of the programme or project but also the financial status of the project. Thus, ongoing projects are monitored not only in terms of their physical status but also in terms of financial disbursements and programmed expenditures. The purpose of monitoring has become two-fold: to review the physical progress in order to identify the probable causes of delays and slippages in implementation, and to review actual versus projected capital expenditures in order to identify possible overspending or shortages. Compensatory changes in other programmes can be made and the plan can be modified if there were early warnings of slippage or budgetary deviation. The output of monitoring and evaluation feeds back as a status review of ongoing projects, and also leads to the revision of the agency and/or local government development programmes.

The scope of issues addressed by CIF evaluation, as distinguished from physical and financial progress monitoring, covers a broader spectrum. Through the evaluation criteria, apparently unjustified projects are to be identified for weeding out or for reexamination by the agencies. The clarification of objectives and priorities and the establishment of appropriate data base for sectoral planning are designed to influence project identification, selection, and timing.

The evaluation methodology as contained in the CIF Final Report, consists of three stages (see figure 37). The first two are a two-stage evaluation of projects, while the third stage is evaluation of the programme. Stage 1 is the initial "sieving analysis" by testing all new projects against five criteria. Stage 2 involves prioritizing of projects which have passed sieving and relating them to available resources. Stage 3 is intersectoral evaluation of agencies' programmes. The intersectoral evaluation feeds back to influence the scale and nature of the agencies' programmes emerging from the Stage 2 evaluation.

According to the CIF Final Report,80/ the line agencies are responsible for evaluation of projects against objectives for two reasons: to facilitate the supply of detailed knowledge of projects and the technical expertise necessary for their evaluation which are only available in the agencies, and to make sure that the evaluation criteria will influence project identification and design. Since these agencies have been implementing capital projects in the NCR over many years, they have adequate trained manpower or access to consultants. They have also established strong links with the major funding institutions, and are therefore in the best position to evaluate their own projects. Much detailed information is available within the various agencies about the justification for and the costs and returns of particular projects; the techniques of project appraisal are reasonably known particularly in those agencies which have semi-commercial financial objectives; and foreign funded agencies. It follows, therefore, that there is no point in the CIF process attempting to duplicate project appraisal. However, the CIF process is vitally important in ensuring that the agencies carry out their evaluation systematically by meeting some social and economic criteria particularly related to the overall planning objectives. It also tries to improve individual project appraisal of each agency by identifying the major issues and options for consideration, establishing the interrelatedness of projects, and securing the necessary interlinkages between the agencies. Overall, the Secretariat provides the basis for the IATWG and the PMS to decide on project cut or implementation as a result of solid and rational evaluation rather than arbitrary consideration.

Figure 37. The proposed approach to project and programme evaluation


PROJECT EVALUATION
Project Identification (Agencies)
Stage 1 Evaluation
. "Sieving" Projects
(CIF - Agencies)
Stage 2 Evaluation
. Prioritization within each Sector
. Formulation of Programme by Sector
(Agencies (and CIF)
Regional Development Framework Plan (MMC)
PROGRAMME EVALUATION
Stage 3 - Resource Allocation between Sectors
(CIF - IATWG)
Available Resources
(CIF - NEDA)
IDENTIFICATION OF PROBLEMS
(CIF - Agencies)
IDENTIFICATION OF AGENCIES
- Basis of Planning
- Consideration of Low Cost Strategies
- Justification of Standards
- Treatment of Risk
- Expenditure on Infrastructure
(CIF Agencies)
ANALYSIS SUPPORTING PROGRAMME (Stage 3) EVALUATION

Source: CIF Final Report, p. 54.

It should be noted that the claim that the line agencies themselves are in the best position to evaluate their own projects is debatable. They may be the most technically competent and best informed for this purpose, but whether they can also pass impartial judgment on their own performance and its effects is open to question. Bias may be mitigated by the choice of impartial consultants and interagency deliberations on evaluation reports. Good evaluation may also be ensured by the reporting of as much relevant objective data as possible and conscious judgment of what such data imply in terms of clearly established criteria and standards. So far, however, such safeguards in evaluation have not yet been evident in the available CIF documents. The presented evaluation system clearly sets five criteria (feasibility, compatibility with the RDFP, impact on equity, economic viability, and financial viability) some of which require extensive information and careful analysis. "Economic viability," for example, requires data on project costs and benefits of various kinds, even within the narrow and vague definition supplied by the CIF *Final Report*.81/ So does "impact on equity." But on the latter point, the first CIF *Annual Report* does not have much information to show except that indicated on a map,82/ which is certainly too crude to help evaluate specific projects. There is hardly any evidence in the report that the objective data required were collected and brought to bear in the evaluation of projects with respect to their impact or intermediate effects as well as progress.

Organization and Management

The CIF was initiated in 1978 and 1979 within the Ministry of Public Works and transferred to MMC in 1980. Its production, and therefore its information system, is currently the responsibility of the OCP, particularly the Integrative Planning Service which is one of the four services of the OCP. The institutions involved in the CIF process which were identified in the CIF *Final Report* are as follows:

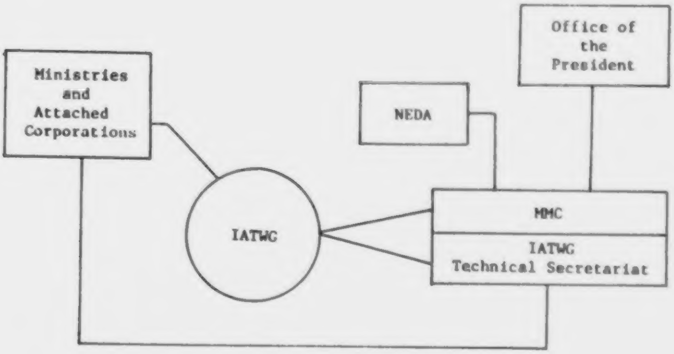
(a) the MMC produces the RDFP, consolidates projects, and is given the functions of a NEDA regional office, in relation to the RDFP and the Investment Programme;

(b) the agencies prepare and evaluate their own projects;

(c) the IATWG (composed of the MMC Governor, Vice Governor, Commissioner for Planning, and Commissioner for Finance; and representatives from the eighteen big spending agencies) (figure 38) becomes the main focus for discussion, coordination, and agreement on projects and programmes; and

(d) the Technical Secretariat reviews the agencies' projects and programmes, produces the CIF Annual Report based on inputs from agencies for IATWG discussion and submission to the NEDA/DBCC, and matches the RDFP produced by MMC with the programmes of the various ministries.

Figure 38. The institutional links


Office of the President
Ministries and Attached Corporations
NEDA
IATWG
MMC
IATWG Technical Secretariat

The Technical Secretariat has been entrusted the responsibility for the CIF information system, as implied in the following tasks: the production and continual review of the RDFP; developing the operational procedures for the IATWG; the production of the CIF Annual Report, liaison with various offices; technical papers to be submitted to the IATWG; and monitoring ongoing projects.

The Planning Commissioner acts as Director of the Technical Secretariat, while the Head of the Integrative Planning Service of the OCP maintains overall responsibility for coordinating the work of the Technical Secretariat. In addition to its regular staff, the hiring of three senior staff as key members of the Secretariat has been proposed -- a planner, an engineer, and an economist/financial analyst -- but has not yet been implemented. The existing staff of the IPS 83/ form the basic staff of the Technical Secretariat. Their actual composition has not been defined, however, because it varies from time to time depending upon the workload and the point of time within the CIF annual schedule. The secondment of personnel from the agencies to OCP and from OCP to the agencies is likewise being encouraged by the CIF, but has never really been fully adopted. This practice of secondment is supposed to help the CIF achieve maximum utilization of agency information by making the agencies aware of detailed planning objectives and needs and ensuring that the Technical Secretariat has up-to-date information. Similarly, the staff from the Technical Secretariat who are more aware of the overall planning objectives could be made available to the agencies to assist in project evaluation.

The IATWG which consists of senior representatives of various spending agencies and chaired by the MMC has been an effective mechanism in providing a forum for each of the agencies to discuss the composition of the CIF. Although it has no executive or decision making powers it has the task of considering the resource implications of the programmes and projects being proposed by the various agencies.

The link between the MMC and the NEDA is expected to provide access to information on resource availability at an earlier stage, and should in turn provide the NEDA with advance information about projects to the NCR and will therefore enable it to improve resource allocation.

In relation to national agencies, the same links maintained by the MMC through the IATWG would enable them to have access to necessary data. With respect to local governments, MMC is supposed to consolidate all local government projects and programmes into the CIF. Formal joint discussions are to take place through periodic meetings with the Mayors and through the representatives of local governments in the IATWG. However, this particular relationship and potential arrangement for facilitating the collection of data and information has never been tapped. There is no effective mechanism yet for communicating the overall CIF proposals to local governments. Local governments so far have not been given a voice in the allocation of resources to the NCR, although the appointment of a local government representative to IATWG is being considered.

PROGRAMME PLANNING

Programme planning, by MMC definition, is a "continuous process of formulating a package or packages of several interrelated projects responsive to definite problems and action areas, oriented towards achieving common goals and objectives."84/

In accordance with the eleven basic needs, the MMC Policy Board has identified the following programmes as priorities: ecological balance, mobility, health, food, shelter, sports and recreation, public safety, water/power, and education/training/culture. Each programme contains several projects of the different operating centres of the MMC. Programmes constitute portions of several offices or units within the MMC.

Programme planning, therefore, assumes that its information system, particularly its data base, will be built on the basis of existing information within each office or operating centre of the MMC. An examination of specific information subsystems of the different operating centres would indicate whether they could possibly meet such information requirements.

Information Use

Despite the absence of an Office of the Commissioner for Operations, the different operation centres had been functioning for quite sometime,85/ most of them prior to the establishment of the OCP. With the reorganization of the Development Planning Office into the OCP in February 1979, it was reasonable to expect that the office could possibly build up programme data base from the existing operational data within the different centres. These include data on the following: barangays, transport and traffic, environmental sanitation, health care, flood control and drainage, police and fire control, and engineering/infrastructure. An examination of data list available at the OCP, however, indicates that so far these data originating and being generated by the operation centres and other offices in the MMC had not been integrated into the programme planning information system of the OCP.

There are several reasons for this inability to make use of existing operational data for planning purposes. First, each of these operations centres has its own planning unit or office to take care and handle its data requirements or needs which makes the OCP role in the whole information system totally negligible. Second, linkages with the OCP have not been properly established because most of these centres were created prior to the reorganization of the OCP. Third, a regular reporting system among these offices has never been formally prescribed, designed, and installed; therefore the use of operational data has been limited to unit or departmental planning. Fourth, the Immediate Staff under the OCP took over the function of programme planning only recently.

Even assuming that the flow of information from the operations centres to the OCP would be regular, the operational data would not be of much use for programme planning purposes for the simple reason that they are not available and not accurate at times. Figures and statistics which could have been based on past performance are completely absent because the operating units have not bothered to record such information.

A good case in point is the solid waste management function being performed by the Environmental Sanitation Centre (ESC). An ad hoc committee, composed of the Metropolitan Waterworks and Sewerage System (MWSS) General Manager as chairman, and representatives from the MMC, Ministry of Human Settlements, MPWH, NEDA, Office of Budget and Management (OBM), National Environmental Protection Council, and METROCOM, as members, was created by Letter of Instructions No. 809 in order to conduct an integrated Metropolitan Manila Solid Waste Management Study under MWSS-World Bank loan agreement and contributions from the member-agencies.

Part of the difficulty in the preparation of the study was the lack of data or information. The initial phase of the work involved a comprehensive characterization of all aspects of the existing system, including collection and disposal practices, management practices, and budgetary procedures. This was not available at all in the ESC which was supposed to record all the methods and transactions relating to solid waste management. The required information was not centrally located. Data on routing and collection are to be gathered from five or six locations.86/

As a result, more surveys had to be made. For the first time in Metropolitan Manila, garbage trucks were actually weighed in order to determine by volume the quantity of waste contained in a truck without resorting to guesswork. The load distribution survey provided a clear picture of the actual conditions which turned out to be somewhat different from those determined from contractor trip tickets.

This data unreliability and inconsistency revealed the defective and insufficient reporting system in the ESC operations. Accurate reports were not being submitted by local offices on the number of truckloads of wastes collected and disposed of in their respective areas of operations.87/ The reports submitted to the central office, on the other hand, did not really reflect actual accomplishments and could not be used effectively for planning purposes.88/

Financial data were likewise inadequate. The inconsistency of ESC records made it difficult to identify the actual share of the programme in ESC accounts. There were no clear guidelines as to what proportion of the various costs can be related directly or indirectly to solid waste collection and transport. A precise calculation was therefore not possible.89/

The process involved in the formulation of the solid waste management plan indicates the lack of an organized information system for planning in the ESC. This situation exists in almost all of the other MMC offices involved in the delivery of integrated services. The OCP has not established effective linkages with the operation centres' planning offices, nor really provided planning support, thus losing its identity as the central planning body for integrated services and also the opportunity to establish an integrated information system which can produce and make use of a wealth of information which is just waiting to be tapped for developmental purposes.

Data Collection and Analysis

The solid waste management experience shows how the MMC has passed up on a perfect opportunity for the generation of useful, accurate, and relevant data which are entirely its own. It has in fact very rarely employed commonly accepted methods of data collection, such as surveys, record examination, mapping, and aerial inspection. For *ad hoc* special projects, though, which are usually funded by outside organizations, these are generally applied, plus other more complicated procedures, such as group discussion, confidential interviews, participant observation, hearings and meetings, and public participation.

In the case of some of the MMC offices, administrative procedures are resorted to. For example, the Action Centre for Infrastructure Development (ACID) uses the approved building permits, and all the ancillary or accessory permits pertaining to buildings and their appurtenances, such as mechanical and electrical permits, sanitary permit, plumbing permit, certificate of occupancy permit, and permit to construct a fence, sidewalk, and signboard, in trying to consolidate the accomplishments in terms of infrastructure development projects of the various local engineering offices within Metropolitan Manila.

The usefulness of administrative records as a potential source of data is however limited due to lack of accompanying analysis. Further, the information yielded through administrative procedures is not in a form which could be readily used for planning. Moreover, office records management has to be extraordinarily orderly and systematic in order to produce or generate accurate and reliable data. Thus, data from administrative records embody raw data which are merely collated, tabulated, summarized, or at best translated into graphic form. In the case of ACID, the data gathered from building permits are integrated in an annual accomplishment report with no high level of analysis evident, except for some simple percentaging to indicate per cent sharing and a pie chart showing size of each project category.

The inadequacy of the different offices, and also of the OCP to a certain extent, in the area of data collection and analysis has given rise to MMC's heavy reliance on secondary sources. The baseline data are mostly taken from other agencies and ministries. Some offices, such as the Traffic Operations Centre, conduct their own surveys as the need arises and as their finances allow.

This reliance on secondary sources gave way to a number of data problems. Since the statistical and line agencies have a nationwide orientation, the data that they generate are usually on an aggregative basis. Disaggregated socioeconomic data on a micro level (e.g., barangay population) are not readily available. There are also problems of comparability of data sources. All three -- spatial, temporal, and topic comparability -- are encountered in the planning of the Metropolitan Manila Region. This is further exacerbated by the inconsistency of sectoral data (e.g., Ministry of Health nutrition figures are different from Food and Nutrition Research Centre figures). In such eventuality, the data of the agency which is more specialized on that sector prevail. At times, however, specialist agencies fail to cooperate and they treat their information as confidential and restricted. This happened particularly in 1974 when the MMC could not gather any data in connexion with the proposed plan to retain Camp Aguinaldo, Camp Bonifacio, and Camp Crame in Metropolitan Manila. The political sensitivity of some information makes the secondary sources more reluctant to give them out freely and without reservations. Statistics on nutrition have always been a good example of this data predicament.

Monitoring and Evaluation

The monitoring being done in most MMC offices and centres is primarily in the form of periodic reports. ACID in particular has been requiring regular monitoring reports from the local government units. A monthly project status report similar to the CIF monitoring form is required. It covers both the physical progress and the costs of the project.

Although monitoring reports are submitted by the offices/centres to the OCP, they are not done on a very regular basis. This is one of the reasons why operational data cannot be used by the OCP as a sound framework for its planning activity.

The evaluation system is part of the OCP's latest effort to assist the centres/offices in the prioritization of projects, i.e., by classifying them either as first priority or second priority. First priority projects are considered urgent or necessary, while second priority projects are deemed desirable.

Evaluation variables include costs and benefits of the project. Benefits are classified under different categories to test the following: distributive effect on income groups, macro environmental impact of project, and approximate quantity of beneficiaries reached. Other variables relate to: consistency with MMC's development policies, goals, and objectives, and ability to resolve current and future problems; practicality in terms of manpower, number and type of skills available, and possible duplication with other MMC implementing units or national agencies; and the need for resources to sustain the project.90/

The evaluation procedures, plus other matters, are discussed in a workshop. The responsibility is lodged with each office/centre, and the OCP takes care of putting together all their projects, the first output of which is a report entitled "1984 Revised Programme Plans." Special forms have been devised for evaluation purposes, and procedures for their accomplishment have also been taught during the workshop. Until recently, the workshop results, particularly the submission of accomplished forms, have not been complied with.

Data Processing

The OCP, as the central planning body of a premiere region, has to deal with voluminous data of varying complexity, accuracy, and consistency. The operations centres alone could yield activity information which needs to be collected, sorted out, organized, and analysed by the planning staff to support the development planning process. As raw data, they come in various forms and aggregations: some are deeply embedded in the text of documents, others are in graphic form, and some are derivable from other data only after extensive manipulations.

The complexity of the task is aggravated by the absence of a computerized data processing system. As of now, manual processes and conventional methods are still being used. Hence, timeliness and accuracy suffer a large setback in the process of computation and other forms of processing.

At the OCP level, a microcomputer has been installed with the help of an outside consultant and with direct participation of the IPS staff. It is presently in the first stage, which is document storage and retrieval system. The staff are in the process of computerized indexing and cross-referencing of the documents from the Capital Investment Folio project.

The computerized information system of the OCP, therefore, mainly services the needs of the Integrative Planning Service, specifically the CIF project, but not those of the Immediate Staff for programme planning purposes.

At the operations level, sophisticated techniques of data processing are only used from time to time when special studies under foreign loan agreement are being conducted. A very prominent example of this very big change or improvement in the data processing system is presented in the case of the solid waste management study. Prior to the study, data collection was not even being done by the centre in charge. With the implementation of the study, the programme was able to start some amount of computerization. For example, the waste characterization data was coordinated with the World Bank Cartographic Programme which was made operational on the local computer. Consequently, waste stream projections can now be made on barangay level for various income levels and population. In order to maximize resources, similar income group locations were used in both the collection and routing study and waste characterization. The details of the study methodology, results, and projections are contained in a separate report of the programme.91/

Computerization at the operating level at this point is not very practical. The more serious needs are for the OCP to design a uniform reports structure for all centres, establish compatibility and comparability of all data originating from them, and ensure a regular flow of communication between them as part of a total information system. Later on, computer modules or subsystems could perhaps be installed and linked to the bigger system at OCP. But first, the OCP, in coordination with the different offices and operations centres, has to establish order and system in the existing data.

Organization and Management

Programme planning is the responsibility of the Immediate Staff of the OCP. To facilitate the "corporate" programme planning process, several groups have been created. These are the MMC policy board, programme and budget review committee, programme planning secretariat, working committees, and technical secretariat. The basic function of planning the projects that would go into a programme plan remains with the operation centres.

The composition of the groups is as follows: MMC policy board consists of the Vice Governor as chairman, and the offices of the Commissioner for Planning, Finance, and Operations as members; the technical secretariat -- Immediate Staff head as chairman, and his staff, OCP, and Office of the Commissioner for Finance as members; programme committees -- head of lead office or centre as chairman, and planning and budget officers of lead office as members; and the programme review committee -- Commissioner for Planning as chairman, Office of the Vice Governor's chief executive staff as co-chairman, and two Office of the Vice Governor's representatives, two OCP representatives, and two Office of the Commissioner for Finance's representatives as members.

Since the function of project planning is still with the different operation centres and offices, the OCP role is mainly in the form of coordinating and collating these projects for the programme plans. Special workshops are held for the purpose.

Local Planning

In relation to local government planning, the MMC, through the Integrative Planning Service of the OCP, provides a common data base to be used by all local governments in the preparation of programmes and projects, and also a clear context for the preparation of Local Area Development Plans (LAP) covering the four cities and thirteen municipalities. Local governments are therefore expected to formulate plans in accordance with the RDFP and to provide a resource allocation system which would take into consideration area needs and potentials together with individual sectoral orientations. They are also asked to implement on a minor scale infrastructure and non-infrastructure programmes and projects prioritized by the MMC and undertaken by national government and private utility agencies. Monitoring and assessment of project impact at the local level are likewise supposed to be part of the planning responsibility of local governments.

This planning relationship between the MMC, specifically the OCP, and the local development planning offices is facilitated by the OCP's distribution among local governments of the "Guidelines for the Preparation of City/Municipal Development Plan" as part of its input information into the local planning process and its assistance in the final formulation of the Municipal Development Investment Programme. It has also devised some forms for the accomplishment of a five-year LAP together with some guidelines. The extent of their usefulness and practicability to local governments, however, becomes questionable and doubtful upon examination of their substance, approach, and methodology in detail. The "Guidelines" has adopted a uniform format of presentation to facilitate monitoring and has standardized the sources of data and their presentation to facilitate integration (see Appendix C). Most of the data requirements, however, are very complicated and sophisticated both in form and in substance. Processing of map information and numerical information is extensively required. For example, out of the different land use related maps (physiographic, slope, natural drainage, flood-prone areas, and earthquake-prone areas), local governments have to describe the municipality's existing land use pattern and determine potentials for further development. On a single data item, several computations may have to be performed. From the NCSO census data on population, the following demographic indicators need to be computed on the basis of some formulas: population size, population growth rate, factors affecting growth rate, household size, average number of families per household, and population density.

Data gaps in the planning information system of the whole MMC are optimistically expected to be supplied and processed by the local governments themselves. As embodied in the "Guidelines," an inventory of roads and bridges, power facilities, and water facilities has to be made by local units, although the OCP itself has to rely on secondary sources for such data.

The RDFP as a source of common data base for all local governments, has very limited utility. Although the same categories of information (location and general description, demography, physical features, economy, social services, and administrative/institutional analysis) appear in the RDFP, they are not yet in usable form for local governments because the RDFP data do not appear in a disaggregated form.

Considering the limited capability of local governments, in terms of staffing and funding, the problems have become bigger and more complicated and therefore difficult to resolve at the local level. As of early 1984, there were only five local governments which have submitted their profile analysis as part of local development plans. These local units have not even gone beyond the first chapter of the "Guidelines" which is profile analysis.

Local government planning within the MMC is being coordinated by the Local Area Planning Division under the IPS. So far, the role of the MMC has been confined to the preparation of framework and guidelines in the preparation of development plans of each city and/or municipality. Formal organizational mechanism and linkages, e.g., committee system, have not been tried by the MMC with local governments.

KEY FEATURES OF THE INFORMATION SYSTEM: A SYNTHESIS

Types and Organization of Information System

There are two emerging types of information system for planning in the MMC. One is the organized, comprehensive system, as exemplified by the RDFP-CIF process; and the other is the *ad hoc* fragmented type, as manifested in project planning of the different operation centres of the MMC.

The RDFP-CIF is the better organized component of the MMC information system for local and regional development. It is fairly well-established with its formal reports structure, organization, methods, and procedures for data collection, analysis, and processing. It is more comprehensive in the sense that its data base coverage is intended not only for CIF purposes but for use of other offices within the MMC. It includes both general-purpose type of data (e.g., demographic and socioeconomic conditions), and specialized information (e.g., investment priorities). Supposedly, it integrates all types of data elements into one comprehensive multipurpose system. For example, economic forecasts embodied in the RDFP are relevant to the programmes of different operation centres and offices of the MMC. For each centre or office to attempt to collect the same information would be inefficient and could produce anomalous situations in which offices within the same agency would be projecting future programme requirements on the basis of differing anticipated futures.

Despite the comprehensive and multipurpose nature and scope of some of its planning processes, such as the RDFP-CIF, the MMC never really established a centralized regional planning information system. The IPS under the OCP which has the primary responsibility over this function is now just in the process of computerizing to a very limited degree the CIF data which are available in order to make them useful to the other service groups, operation centres, and offices of the MMC, and outside clientele.

Ad hoc information system for planning is typified by the operation centres where the system is established only for a specific purpose at one particular point in time. From data collection phase to data processing stage, requirements are met as the particular need dictates. There are no available records with which to start, simply because day-to-day operations have not been properly recorded, reported, nor evaluated. Thus, data collection, analysis, processing, and organization are made only when planning for a particular project or programme. In some cases, however, the resulting information system is continued after the programme or project has been terminated and is therefore no longer considered *ad hoc* by definition.

The information system of some of the operation centres and offices is likewise considered ad hoc and fragmented in this study where there is no regular and systematic method of data analysis, processing, and usage at the OCP level, no matter how systematized and regularized the data collection is at the operating centre level. Thus, information coming from ACID or any operation centre through periodic and systematic reporting system will still be considered ad hoc when viewed or considered in the light of the role of OCP as overall coordinator and user of this specific planning data. These are areas which cannot be altogether typed as ad hoc but, due to the absence of definitive information linkages or relationships with OCP, have manifested ad hoc tendencies. Too, there are sectors or offices within the MMC which have different records keeping and reporting procedures with widely varying degrees of detail or none at all, thereby resulting either in overload or insufficient data in the OCP planning information system.

In the MMC, the information system is usually formally organized through some special studies, such as the Solid Waste Improvement Programme (SWIP), the Urban Transport Terminals Study for Metropolitan Manila (January 1981), and Metropolitan Manila Urban Transport Improvement Project (MMUTIP - August 1981). These are prepared by outside consultants in cooperation with the respective operation centres and other offices of the MMC, together with the OCP. The role of the OCP however is minimal and is confined primarily to being a member of the ad hoc committee or the expert review panel created for the purpose. The end of the project therefore likewise signals the end of OCP's participation and does not extend to the monitoring and evaluation stage. Copies of reports are furnished but a regular reporting system to the OCP from the responsible unit or office is completely missing. Therefore, prior to the undertaking of special studies, information system in the MMC operations, particularly as it relates to planning and regional development, is almost always ad hoc and disorganized.

In areas where there are no internationally-funded studies being undertaken, the ad hoc nature of the system has become more pronounced. In the absence of any special project to systematize management of information, the ad hoc disorganized form has continued to manifest itself.

Theoretically, the OCP is the office responsible for the planning information system in the MMC and its capacity as the central planning body of the region. It formulates the regional and metropolitan development plans in conformity with established national and metropolitan development goals and objectives. It also coordinates and monitors plans, programmes, and projects of other agencies. Its Chief also serves as Zoning Administrator and therefore implements and enforces the Metropolitan Zoning Ordinance and community improvement programmes.

The OCP is composed of four service groups and a support administrative/management staff (see figure 32). The service groups and their functions are as follows:

The Integrative Planning Service is entrusted with the task of preparing a long-term comprehensive development framework plan, investment programming and prioritization, local area planning, and sectoral planning.

The Land Resource Management Service (LRMS) provides the essential regulatory functions for the proper use and management of land to rationalize and optimize land use and development.

The Planning Support and Research Service (PSRS) is in charge of developmental communications, community relations and development, and the planning/research inputs in relation to policy and planning decisions.

The Urban Design and Development Service (UDDS) formulates plans for site development and renewal, designs special areas for planning, and other operational requirements.

Assisting the Commissioner is the Immediate Staff which provides executive advice, and develops and maintains internal policies, control methods, and systems and procedures. It is also responsible for programme planning and establishing MMC's short-term and long-term corporate goals and objectives.

Each of the above service groups pursues and collects its own data requirements independently of each other. PSRS maintains its own data bank, but it is primarily for an effective integrated development communication programme. In 1984 IPS established a data bank which is concerned mainly with the CIF project documents and information. All of the service groups are expected to provide inputs into the RDFP but except for the meetings of the group in which most of them are members, their coordination with respect to the information system has been very limited.

MMC planning also involves operational activities, particularly in relation to short- and medium-range plans and projects. The Office of the Commissioner for Planning is therefore involved in actual operational activities, in the form of coordination, regulation, or actual operations through several projects. However, since the different operation centres have been established prior to the OCP, majority of actual planning and implementation of such activities are usually done by these centres. The situation inevitably gives rise to an information system that is specialized and geared to the particular needs of a specific project or ad hoc activity. In fact, critical issues identified in the "City of Man" document have been met with short-term projects that were directly planned and implemented by offices other than the OCP, including foreign consultants. A typical example is the World Bank Urban III project which involves six priority components to the shelter, infrastructure, sanitation, and employment problems in Metropolitan Manila as part of the US$72 million development loan agreement between the Philippines and the World Bank. One such component is the Solid Waste Improvement Programme, which is designed to enhance the present capability of the Environmental Sanitation Centre in storage, collection, and disposal of solid wastes in Metropolitan Manila.

On the whole, despite the existence of special organizational mechanisms at the MMC level (e.g., *ad hoc* groups and consultants) the regular organizational structure itself gives rise to a number of difficulties and constraints in the planning information system.

The OCP has not established effective linkages with the local governments and with the operation centres' planning units, thereby losing its identity as the central planning office and losing the opportunity to establish an integrated information system. This lack of coordination can be traced to the existing politics in the whole MMC. The heads of the Office of the Vice Governor, Office of the Commissioner for Finance, and the Office of the Commissioner for Planning are all presidential appointees. Thus, they are politically and administratively autonomous of each other. Each office has its own system to follow, and the OCP has been unable to require the operation centres and other offices to submit monitoring reports for planning purposes.

The existing formal organization creates an overlapping of responsibility over the planning information system which further results in diffusion of efforts. While the OCP has been specifically envisioned to undertake "data base development, institutionalization of data banking, and management information system," recent developments indicate the trend towards the creation of a separate office for the same purpose. As part of a World Bank project started last year, the Institutional, Management, and Information Study was organized to establish, among others, "a data base centre for use of MMC local units as guide in the formulation of policies and future development goals."[92]

The fluidity of organization is not confined to the information system alone. The whole of Metropolitan Manila Commission is still experiencing a large degree of uncertainty. A third Commissioner for Operations has not been filled so that the Office of the Vice Governor has to assume responsibility over the different operating centres. This is the main reason why the OCP fails to coordinate effectively the activities of these centres, much less their information system for planning of Metropolitan Manila.

The presence of three levels of planning in the region (local, national, and metropolitan) has further resulted in a regional planning information system that is diffused and fragmented. Local planning which primarily deals with its traditional role in the implementation and maintenance of minor infrastructure works (except local governments which can afford to engage in such major infrastructure projects as roads, drainage, health centres, and public markets) has an information system primarily consisting of socioeconomic profiles of the area. National planning is basically sectoral. The different agencies, such as the Ministry of Public Works and Highways, National Housing Authority, Ministry of Transportation and Communications, Ministry of Human Settlements, and Metropolitan Waterworks and Sewerage System, operating in Metropolitan Manila, have specific plans and specific planning activities and projects which give rise to special-type information system. Metropolitan planning is more of a coordinating function rather than a plan formulation function. The Office of the Commissioner for Planning coordinates and monitors plans, programmes, and projects of other agencies. It translates into programmes and project packages such activities relating to the development objectives, strategies, and policies, even as it simultaneously prepares the overall comprehensive development framework plan.93/ In addition, the different operating centres within the MMC perform planning functions and activities of their respective specialized areas of concern. This kind of metropolitan planning therefore has given way to a type of information system which is basically a collation or summary of general-purpose data and statistics in the planning office itself, on one hand, and of partial systems in the different operating centres, on the other hand.

Data Base Deficiencies

The comprehensive type and coverage of planning at the MMC level calls for an extensive and intensive information base. However, its major plan documents have failed in this respect. The "City of Man" was for the most part a general statement, incorporating specific proposals and other types of data only in summary or schematic fashion. It showed very little of its information base. The RDFP, although presenting more quantitative data, is also deficient in its data base, analysis, and projections. There was no sufficient detail to enable users to judge the soundness of the Plan's basis for its proposals. The CIF was not placed on a firm data base because, as it noted, "the collection of reliable information about projects and programmes has proved difficult...." Its working papers were brief, tentative documents that were uneven in the quantity and quality of data they contained.

Despite apparent efforts at greater precision and analysis, especially in the RDFP, the plan documents leave much to be desired. There still remain serious gaps in data, analysis, and inferences. The analyses and projections, for instance, were not performed in the RDFP with any degree of consistency in all sectors. There was also unevenness in the baseline data; some data were available for 1980, others earlier or later than 1980. Noncomparability had also become a problem because of the different units of disaggregation employed by different agencies or sectors; some by region, others by municipality.

The framework data can also be considered limiting due to the unavailability and inadequacy of other forms of information, notably maps. Large-scale metropolitan base maps are not always available and extensive map-based data is inadequate. The deficiency had been noted as far back as the beginning of the MMC in the "City of Man" document. It therefore proposed the development of planning map capabilities consisting of: (a) preparation of large-scale 1:1,000 base maps; (b) inventory of existing maps of the metropolitan area; and (c) preparation of thematic maps.94/

For CIF purposes, the maps that were available had a scale of 1:25,000. There were roughly ten in all: water supply and distribution projects, existing land use map, physiography and soils, strategic development recommendations, income level, major infrastructure projects, slope map, population density, flood-prone areas, and traffic flow map (1979). Some of these maps were prepared by the Land Resource Management Service which probably has developed its mapping capabilities due to the nature of its function, which is land use mapping. But even in this office, existing gaps in map availability are apparent. Its cadastral maps requiring a scale of 1:5,000 are incomplete, barrier maps of physical and geological nature are absent, and aerial photos are available only in a scale of 1:25,000 instead of the required 1:10,000.

The proposed (and soon-to-be-started) MMAPS project is partly intended to fill this particular data gap. A detailed land use map derived from the latest aerial photos shall be prepared, classifying the different land use areas into residential, commercial, industrial, institutional, open spaces, and agricultural. Thematic maps will also be drawn. These shall be drawn on separate overlays, but appropriate combination of facilities in one overlay shall be done. The following combinations may be drawn in different overlays: (a) road, transport survey, and grid network and names; (b) drainage and flood control facilities; (c) water supply and sewerage facilities; (d) power and telephone network; (e) gas and fuel pipe networks; and (f) social infrastructure, facilities, and economic enterprises.

Secondary Sources and their Limitations

The deficiencies noted in the data base are mainly due to reliance on secondary sources which do not have the same kinds, quantity, and quality of data. Both the RDFP and the CIF drew heavily from previous planning and agency studies. Like other agencies, the MMC must normally rely on the National Census and Statistics Office for more complete and common demographic and socioeconomic statistics.

Secondary sources, however, have their own limitations. There are divergent or conflicting data due to variations in coverage, definitions, and methods used in different surveys. The same agency may change its definitions of unemployment, or literacy, over time. Different agencies may use different sampling methods or cover varying aspects of the same topic.

Generally, the data from the NCSO serves all planning and implementing units of the MMC. As a central data source not only of the MMC but also of the whole country, the NCSO also has its own share of limitations. Its two operations, the census and the survey,95/ are not usually finished on time. The economic census, for instance, which is normally done every five years has its latest issue published in 1978 while the 1985 census is yet to be started. Conflicts of data are also inevitable, e.g., NCSO population census is different from that of the Ministry of Health. There are data problems that usually arise therefore. Timeliness is a factor which limits the reliability and accuracy of secondary data. In fact, the RDFP had to use 1975 figures for its data requirement on family income. The problem of data nonuniformity or inconsistency is being solved by the MMC planning office through the use of data originating from the agency specializing on it.

The reason for the NCSO delay in data publication or dissemination is the lack of qualified personnel. The office yearly gives qualifying exams in English and Math to new students for special training as technical staffers. Out of the 200 who took the exam last year, for instance, only thirty passed. Once they finish training, they also transfer jobs. Delays in field operations in far-flung areas also constitute a big problem.

As regards data conflicts and/or inconsistencies, the reasons given by NCSO were mainly the lack of standardized data definitions and the differences in sampling design. For example, employment/unemployment figures of the NCSO are very different from those published in some studies which used quota sampling instead of probability sampling employed by NCSO. Different definitions of terms were also used. NCSO included self-employed individuals such as jeepney drivers, cigarette vendors, and the like, but did not include laid-off employees and the idle people on the streets who did not try to seek employment. Other studies, however, considered them not as "unemployed" but as "underemployed" since they have utilized their separation payments to engage in small businesses.

Even the NCSO data tended to vary from year to year. Literacy rate, for instance, decreased from 1970 to 1980. Further examination revealed that the cause was the change in the Manual of Instructions itself. In the 1970 census, as long as the person can write his name or vote, he was considered literate; whereas in 1980, only those who have completed Grade IV were counted as literate.

Time series analysis and comparisons have been rendered difficult, and at times impossible, due to these changes in definitions and concepts adopted by statistical agencies. A group of young economists from the School of Economics, University of the Philippines assessed the problem in the following manner:96/

> As an example, consider that the employment figures published by NCSO for 1982 show the Philippine unemployment rate to be 5 per cent. Quite apart from the question of underemployment, it would seem implausible that in the middle of the recession, the Philippines posted a figure close to what may be considered full employment in the U.S. or the U.K., respectively. The explanation is to be found in the definition of 'employment': anyone who worked one hour in the preceding three months is considered employed (Tidalgo and Esguerra 1982). In 1976 the reference period was changed from 'the past week' to 'the past quarter'. Moreover, employment was expanded to include such activities as home gardening and raising poultry, as long as there was a harvest. These changes effectively increased the numerator of the employment rates. The base of the employment rate, which is the labour force, was also changed. Where before the labour force included the population 10 years old or over, who were either employed or looking for work, the cutoff age was changed to 15 years, thus reducing the size of the denominator. All these changes tend to reduce the unemployment rate figure. What is additionally vexing is that, since data based on

the older definition are no longer being collected, researchers no longer have a basis for comparing employment performance before and after 1976.

A similar shift has occurred in statistical series on wages. Before 1981, the most helpful series in assessing the trend in wages was the Central Bank series, which was based on a survey of wages actually received by workers in various establishments. However, in 1981 this series was terminated and the only series available has been one on legislated wages. If only because noncompliance with wage legislation is rampant, the latter series would overestimate the average level of wages being received.

Since the MMC makes extensive use of secondary sources, such as the NCSO, these data problems and constraints at the central level likewise affect the planning information system for the Metropolitan Manila region.

The Need for Computerization

The need for the MMC to computerize, especially at the OCP level, is underlined by the existence and demand for voluminous data which are necessary for metropolitan development planning purposes. With the introduction of computer, more collection, storage, and manipulation of data can be made possible.

At this stage, though, automation seems to be serving very limited needs. The library system model for CIF data would at most organize the records or filing system of documents. There is still a long stretch (the design said five years) before reaching the decision support stage when the data base system can be grafted into policymaking decision models. But with this initial step, the existing "chaos" in the data system of MMC can be greatly minimized.

The concentration of the newly-installed computer on CIF documents is logical and understandable considering the volume of data which they contain. But the operation centres themselves could be a rich source of information just waiting to be tapped.

An overall direction and design for the future computerization of the other planning subsystems have to be mapped out. In addition to a central computer system of general applicability which would serve all centres and offices, and even outside clientele, potential modules or subsystems should be developed. Their possible linkage with the central system should be planned ahead of time. Necessarily, the present reporting and recording system of activities, outputs, and the like, should be restructured in order to assure compatibility and comparability of data which could then be fed into the computer.

Evaluation Methodology and Responsibility

The data for evaluation which are called for and available to MMC are mostly of the input and output kinds. Although the different planning subsystems implicitly require impact data as well, it is doubtful whether information about impacts has been systematically collected and used. As contrasted with impacts, outputs reflect the immediate results of projects being implemented. Outputs are perhaps resorted to most frequently by the MMC partly because they are easier to measure than impacts since their data sources are within the organization. Impacts on the other hand, are external and therefore more expensive to collect.

Since the CIF is basically a form of financial or budgeting instrument, its data requirements for monitoring purposes are confined to programme or project and resource information, specifically the physical progress and the financial status of the project. The evaluation criteria established by the CIF are primarily the responsibility of the implementing line agencies to apply in practice and are outside the operating scope of the MMC planning information and evaluation system. The RDFP, too, is not so much concerned with evaluation at the project or programme level because its major purpose is to provide a general framework for metropolitan development and relies on broad, aggregative data for that purpose.

It is in programme and project planning that the need for impact data becomes more pronounced. MMC, however, has failed to incorporate information about impact or effectiveness of programmes. To do this, MMC, or the operation centres, have to go beyond the bounderies of the organization to examine the consequences of particular projects for the public. This makes primary surveys and evaluation studies imperative and increases the need for analyses. The MMC does not have the capabilities, or at least has not manifested inclinations in this direction, for both the conduct of surveys and evaluation studies and analyses of data.

Although surveys are being conducted from time to time by some offices and centres of the MMC, they are quite rare and uncommon. The Traffic Operations Centre, for example, conducts its own surveys as the need arises and as its finances allow. As much as possible, though, it relies on other agencies for its data needs and requirements.

The conduct of surveys specifically designed for collection of impact information is almost nil, except of course in the case of special studies and projects being undertaken by foreign and other outside consultants. In fact, MMC's heavy reliance on secondary sources is partly brought about by this inability to conduct surveys of its own to suit its particular planning needs. A proposal of the OCP, particularly the IPS, to organize survey teams has not materialized on account of financial constraints and the possible conflicts that may arise between the OCP and the statistical/line agencies in case of inconsistencies of results.

In the case of programme planning, too, the responsibility for monitoring and evaluation has never been really pinpointed. The newly-created Institutional, Management, and Information Study group under the Office of the Vice Governor is now in the process of devising a monitoring and evaluation programme for MMC projects. The Immediate Staff of the OCP, on the other hand, is right in the middle of role definitions. Logically, though, the IS should also assume responsibility for evaluating, or at least coordinating the evaluation, of projects which should go into its programme plans.

As a result of the above technical deficiencies and organizational uncertainties, the job of monitoring and evaluation at the MMC has remained dormant.

Conclusions and Recommendations

From the previous descriptions and analyses of the MMC's information system, it would appear that while it may have been designed to be as comprehensive as its planning framework, the system has actually been deficient in terms of its data base and in other respects. This is evident in the outputs of its more formalized components -- the RDFP and the CIF -- as well as in its ad hoc elements -- the operation centres' programmes. For the most part, the system has relied on secondary data whose original sources themselves suffer from certain defects, and has used or presented both quantitative and qualitative data too sparingly to produce well-informed and informative planning and evaluation documents. The organization and processes underpinning the information system have also tended to be fragmented, although proposals have been made toward more systematic data collection, reporting, and processing procedures for monitoring, evaluation, and plan revision.

The requirements of MMC for a more adequate and integrated information base, as implied by its comprehensive approach to metropolitan development and planning, suggests several improvements that need to be taken: first, the data base of the system needs amplification and better articulation; second, there is a real need for computerization; third, the information subsystems need to be much better linked together; and fourth, the organization has to conform to the comprehensive and integrated requirements of the information system.

The data base should be expanded to fill serious gaps for both planning and evaluation purposes. More complete benchmark and time-series data on such basic matters as population and socioeconomic conditions and trends should be collected and organized and should be analysed, projected, and presented more fully and, whenever appropriate, on a disaggregated basis. To minimize the shortcomings of secondary data, it may not be too late for the MMC to consider conducting a baseline survey on at least its crucial areas of concern and instituting a programme to periodically update benchmark data. Since the next population and housing census will be held in 1985, such a survey may be synchronized with the census and arrangements made for early processing of census data for Metropolitan Manila. Similarly, data about the impact as well as progress of specific projects and operations should be systematically recorded, reported, and evaluated. The data categories needed for planning and evaluation, the criteria, indicators, and standards to be used for planning and policy decisions, and the research and analytical methods required would probably need to be refined as well if the information system is to work well. Some measures in this direction have already been initiated, e.g., the development of more sophisticated maps, but other measures need to be stepped up or initiated.

Automation of existing information does not a management information system make.97/ In the MMC, the computer has been initially introduced at the OCP level, with no attempt to look at the system as a whole and to provide overall direction in the future computerization plan of other units directly or indirectly involved in planning. The initial scheme is just for the storage and retrieval system specifically of CIF data, but the information needs on the whole indicate that the development of subsystems is required at the operating level and these components have to be integrated into the bigger system located at the OCP.

The different subsystems now existing are supposed to provide information for different purposes and users. But while voluminous data are collected at some points, most of which are of little use, some needed information is not generated at all, and still others are similar or identical. Although the purposes and users may vary, thus making overlaps inevitable, there is a need to link them with each other in order to avoid unnecessary data overload, gaps, and duplication.

As it is, the baseline, activity, and evaluation data remain dispersed throughout the bureaucracy, i.e., in computer, filing cabinets, desk drawers, and thick documents. Unless retrieved and organized for use, such data can be of little value in planning. As it is, the data continue to be assembled in an uncoordinated fashion. The complexity of the Metropolitan Manila planning structure, particularly in terms of the multiplicity of operating centres and national agencies operating in the region, necessitates coordination of information activities and underlines the need for a central mechanism for this purpose.

A management information system for regional development which is properly coordinated and synchronized at the highest planning level would be desirable and imperative. It should be designed to avoid, on one hand, gaps in information and, on the other, duplication of information-gathering that results when agencies are allowed to collect whatever information they deem appropriate. The most important elements to consider should be the type of information that should be collected and how the various components of the system will be linked with each other. Other relevant questions would be: Who needs it? Who has access to it? Who will collect it? How can it be kept current? What will be the provisions for its storage and retrieval?

A central unit, probably the IPS under the OCP, should be responsible for collecting information of general applicability to different offices or units, while operation centres should collect more specialized information. Computerization at this very early stage should be designed with the end in view of developing modules or subsystems that can later be linked with each other. A major task, therefore, would be to inventory existing capabilities. Compatibility and comparability of data should also be a major concern of the central unit.

Overall, the need for the MMC to computerize is underlined by the actual existence and potential demand for comprehensive data which are necessary for development planning purposes. But first it has to establish order and system in the existing data which need to be fed into the computer.

NOTES

1/ The four cities include Manila, Quezon, Caloocan, and Pasay; the thirteen municipalities are the following: Mandaluyong, San Juan, Marikina, Pasig, Malabon, Navotas, Valenzuela, Makati, Parañaque, Las Piñas, Muntinlupa, Taguig, and Pateros.

2/ Presidential Decree No. 1274 (27 December 1977) provided for a Metropolitan Advisory Council (Sangguniang Kalakhan ng Maynila), but this body has not been actually formed.

3/ Ibid.

4/ See section 4, Presidential Decree No. 824.

5/ See sections 6 and 8, P.D. No. 824.

6/ See section 10, P.D. No. 824.

7/ See Ordinance No. 78-2, 7 January 1978, later revised as Ordinance No. 81-01, 18 March 1981.

8/ Peter Hall, Urban and Regional Planning (Middlesex, UK: Penguin Books, 1982).

9/ See "Manila: Toward the City of Man," pp. 6-8.

10/ These include: food, water, clothing, power, mobility, ecological balance, education/culture/technology, sports and recreation, medical services, economic base/livelihood, and shelter.

11/ By its own definition, the "Structure Plan" proper pertained only to the physical form of the desired pattern of metropolitan development; it was "the physical expression of the identified development and major proposals," as shown on the map on p. 29 of the Plan.

12/ Page 17 of the "Structure Plan" cite the period 1960-2000 as the time-frame.

13/ Ibid., p. 12.

14/ In an interview with one of the authors, it was claimed that "Manila: Toward the City of Man" took barely three months to prepare and thus did not allow time for a more exhaustive documentation of data. It had to rely on secondary data for most of the analysis and recommendations. It also did not want to encroach on other agencies' planning prerogatives, i.e., the National Economic and Development Authority, the Ministry of Public Works and Highways, and other ministries.

15/ "Manila: Toward the City of Man," p. 59.

16/ Ibid., p. 6.

17/ Metropolitan Manila Commission, Office of the Commissioner for Planning, "Regional Development Framework Plan, 1983-92" (Quezon City, 1982).

18/ For example, physiographic characteristics; see table 2.1 of the RDFP.

19/ Metropolitan Manila Commission, "A Humanist Approach to Urban Management." (Quezon City, 1982), p. 21.

20/ RDFP, p. 37.

21/ Ibid., figure 2, pp. 44-5.

22/ Ibid., pp. 11-8, 81-9.

23/ Ibid., pp. 82-3.

24/ Ibid., pp. xx and 31.

25/ Ibid., pp. 31-6.

26/ Ibid., table 4.1, p. 94.

27/ Metropolitan Manila is otherwise referred to as "National Capital Region" in national statistics and planning.

28/ RDFP, pp. 39, 41, and 49.

29/ Ibid., table 2.2, p. 46.

30/ Ibid. All this says is "N.A." or not applicable.

31/ Ibid., figure 2.10, p. 48.

32/ Ibid., p. 96.

33/ Ibid., p. 100.

34/ Ibid., p. 98.

35/ Ibid., p. 102, though past projections up to 1980 are cited on p. 51.

36/ Ibid., table 4.14, p. 134.

37/ Ibid., pp. 71 and 135.

38/ Ibid., pp. 59-63.

39/ Ibid., pp. 124-6.

40/ Ibid., table 4.10, p. 127.

41/ See Metropolitan Manila Commission, Land Resource Management Service, "Primer on Land Use and Zoning Metropolitan Manila Area" (mimeo).

42/ A "locational clearance" is a written authorization or permit granted by the Metropolitan Manila Zoning Administrator allowing the construction, development, and/or use of certain areas or any parcel of land according to the approved land use and zoning plans of the concerned city or municipality (see "A Humanist Approach to Urban Management," p. 120).

43/ RDFP, pp. 165-6.

44/ Ibid., p. 161.

45/ See Working paper no. 3 (1982), p. 1.

46/ Metropolitan Manila Commission, Metropolitan Manila Capital Investment Folio Final Report (Quezon City, 1982), figure 5.1, pp. xiv-v.

47/ Ibid., p. xxi.

48/ Ibid., p. xxiii.

49/ Ibid., p. xvi.

50/ Ibid., figures 7.1, 7.2, and 7.3.

51/ Working paper on population, p. 1.

52/ Working paper on transport (no. 4, 1982).

53/ Metro Manila Transport, Land Use and Development Planning Project (Quezon City: Govt. of the Philippines and Freeman Fox & Associates, 1977).

54/ Metro Manila Urban Transport Improvement Project (Quezon City: Govt. of the Philippines and Consultants; with Sycip, Gorres & Velayo, 1981).

55/ Working paper on transport, figures 1 and 2, pp. 4 and 5.

56/ Ibid., p. 2.

57/ Ibid., p. 6.

58/ Ibid., p. 7.

59/ Ibid., p. 9.

60/ Ibid., p. 10.

61/ Ibid., see map and figure 11.5, pp. 13-4.

62/ Ibid., pp. 12 and 16.

63/ Ibid., p. 1.

64/ The Final Report recommended that, in addition to direct investments, the CIF should eventually include loans and credits that help produce fixed assets (e.g., livelihood and low-cost housing programme expenditures) among the capital expenditures. It also suggested the inclusion of maintenance and other expenditures (pp. 41-2).

65/ CIF Final Report, tables 8.4 and 8.5, pp. 101-2.

66/ Ibid., p. 154.

67/ Ibid., p. xxii.

68/ Ibid., pp. 173-5.

69/ Ibid., p. 175.

70/ Ibid., p. 172.

71/ Ibid., pp. 161-3.

72/ Ibid., p. 174.

73/ Metropolitan Manila Commission, Metropolitan Manila Capital Investment Folio Manual (Quezon City, 1982), pp. 35-9.

74/ Metropolitan Manila Commission, "Metro Manila Physical Survey (MMAPS) Terms of Reference" (typewritten).

75/ CIF Final Report, section 3.7.

76/ Ibid., p. 42.

77/ The Committee is composed of the Minister of Budget and Management as Chairman, and the Director General of NEDA, the Minister of Finance, and the Governor of the Central Bank as members.

78/ Eduardo Gamboa, "Design of a Document Storage and Retrieval System for the OCP, MMC" (October 6, 1982) (typewritten).

79/ "MMAPS Terms of Reference."

80/ CIF Final Report, p. 52.

81/ Ibid., p. 59.

82/ Metropolitan Manila Commission, Office of the Commissioner for Planning, Metropolitan Manila Capital Investment Folio Study Annual Report (Quezon City, 1983), figure 13, p. 12.

83/ The Integrative Planning Service regular staff consists of the following: service chief, assistant service chief, senior planning officer, planning officer, planning assistant, secretary, senior draftsman, research assistant, driver, and messenger.

84/ Metropolitan Manila Commission, Office of the Commissioner for Planning, Immediate Staff, Draft Manual.

85/ Environmental Sanitation Centre was established in 1976, Barangay Operations Centre in 1976, Engineering Operations Centre in 1977, Health Operations Centre in 1980 but had its beginning in 1975, the Action Centre for Infrastructure Development in 1979, the Traffic Operations Centre in 1977, and the Special Operations Centre in 1979.

86/ Metro Manila Solid Waste Management Study Final Report (Quezon City, 1982), 1:1.

87/ The Chief of Systems Planning under the Deputy Director for Solid Waste Management revealed in an interview that there are no available accurate records on the volume/number of truckloads of waste disposed since 1977.

88/ "Ghost" deliveries were suspected since reports on the number of truckloads/volume of garbage disposed seemed to be overstated.

89/ Metro Manila Solid Waste Management Study Final Report, 5:11.

90/ Metropolitan Manila Commission, Office of the Commissioner for Planning, Immediate Staff, Workshop Papers.

91/ Metro Manila Solid Waste Management Study Final Report, 1:4.

92/ "Institutional, Management, and Information Study Terms of Reference."

93/ See "A Humanist Approach to Urban Management," pp. 111-5.

94/ See "Manila: Towrd the City of Man," p. 63.

95/ Census is the complete count of housing and households and population usually done in three to ten years' period; survey is the enumeration of less number of items and covering shorter periods of time.

96/ University of the Philippines, School of Economics, An Analysis of the Philippines Economic Crisis: A Workshop Report (Diliman, Quezon City, 1984), pp. 165-6.

97/ Robert D. Lee and Ronald W. Johnson, Public Budgeting Systems (Baltimore: University Park Press, 1983).

APPENDIX A. RDFP DATA CATEGORIES AND SOURCES, WITH ACCOMPANYING TABLES, MAPS, AND CHARTS

Information Available	Sources*	Tabulated Data, Year(s) Covered, and Sources	Maps, Year(s) Covered, and Sources	Charts/Graphs, Year(s) Covered, and Sources
REGIONAL PROFILE				
1. Physiographic Context	BOL, BOS, OCP			
1.1 location and structure			Fig. 2.1 Land Structure of NCR	
1.2 physiographic characteristics by zone	Preliminary Physical Planning Study of the CIF Project (OCP), Aug. 4, 1981	Table 2.1 Physiographic Characteristics of the NCR by Zone (Source: Preliminary Physical Planning Study of the CIF Project-OCP, Aug. 4, 1981)	Fig. 2.2 Regional Physiographic Structure Fig. 2.3 Cost Constraint Zones	
1.2.1. slope				
1.2.2. flooding frequency				
1.2.3. depth to watertable				
1.2.4. depth to bedrock				
1.2.5. soil stability				
1.2.6. soil shrinks well				
1.2.7. soil corrosivity				
1.2.8. earthquake damage				
1.3 land use and urban growth patterns			Figure 2.4 Land Use	
1.3.1. the emerging plateau spine				
1.3.2. northern and southern growth trends				
1.3.3. Marikina Valley and Laguna Lowland Dev't.				
1.3.4. the emerging bayside spine				
1.3.5. industries				

Information Available	Sources*	Tabulated Data, Year(s) Covered, and Sources	Maps, Year(s) Covered, and Sources	Charts/Graphs, Year(s) Covered, and Sources
2. Environment	NPCC, NEPC			
2.1 climate				
2.2 atmosphere				
2.3 water pollution				
2.4 river systems				
2.5 odour				
2.6 coastal environment				
2.7 garbage				
2.8 smoke				
2.9 noise				
2.10 land use and environment				
3. Population	NCSO			
3.1 population by region density by city/municipality, 1980			Fig. 2.6 Population Density by City, Municipality, 1975-80	Fig. 2.5 Population by Region, 1980 (Source: NCSO, March 1982)
3.2 growth rate by city/municipality, 1975-80				
3.3 number of live births and birth rates			Fig. 2.7 Population Growth Rate by City/Municipality, 1975-80	
3.4 number of deaths and death rates by cause				
3.5 number of in-migration by age, by origin and destination				

Information Available	Sources*	Tabulated Data, Year(s) Covered, and Sources	Maps, Year(s) Covered, and Sources	Charts/Graphs, Year(s) Covered, and Sources
4. Economy				
4.1 gross regional domestic product (GRDP)	NEDA			Fig. 2.8 NCR Gross Value Added by Sector, 1974-80 at constant 1972 prices (Source: NEDA March 1982)
4.2 economic sectors	NEDA			
4.2.1. agriculture				
4.2.2. manufacturing share in GRDP number of establishments classified according to size of establishment (capitalization) organizational management				
4.2.3. construction share in GRDP number of establishments and growth rates				
4.2.4. commerce share in GRDP number of establishments and growth rates classified according to the kind of economic activity				

Information Available	Sources*	Tabulated Data, Year(s) Covered, and Sources	Maps, Year(s) Covered, and Sources	Charts/Graphs, Year(s) Covered, and Sources
4.2.5. utilities, transport and tourism number of visitors and growth rates number of hotels and accommodation capacity classified according to class standards income generated by average daily expenditure and tourist - average stay	MOT			
4.3 family income and expenditures	MOLE, NCSO			
4.3.1. total and average income and distribution				Fig. 2.9 Distribution of Family Incomes, Philippines and NCR, 1975 (Source: NCSO)
4.3.2. income inequality				
4.3.3. food and total thresholds (nutritional requirements)				
4.3.4. family expenditures classified according to percentage allotment of income to the kind of threshold expenditures				
4.3.5. unemployment rates and job availability				Fig. 2.10 Number of Unemployed Persons and Job Vacancies in the NCR, 1975-80 (Source: for unemployed persons, NCSO; for job vacancies, Bureau of Employment Services)

Information Available	Sources*	Tabulated Data, Year(s) Covered, and Sources	Maps, Year(s) Covered, and Sources	Charts/Graphs, Year(s) Covered, and Sources
4.3.6. employment rates by sector and place (overseas, domestic) and average earnings		Table 2.2 Employment by Industry Major Group, NCR, 4th Quarter, 1978 and 1979		
5. Infrastructure Service and Utilities				
5.1. Transportation sector	BOT, MOTC, PNR			
5.1.1. number of establishments and vehicles classified according to utility (buses, jeepneys, taxis) and service routes		Table 2.3 Percentage of Average Daily Traffic 1981 (Source: MMETROPLAN, 1976)		
5.1.2. number of daily services and routes by commuter trains				
5.1.3. number of private cars				
5.1.4. average percentage of daily traffic and place of congestion				
5.2 water supply	MWSS			
5.2.1. amount of daily water consumption according to water sources (groundwater, surface water, other existing sources, possible future sources)				Fig. 2.11 Principal Watersheds and Basins

Information Available	Sources*	Tabulated Data, Year(s) Covered, and Sources	Maps, Year(s) Covered, and Sources	Charts/Graphs, Year(s) Covered, and Sources
5.2.2 treatment				
5.2.3 distribution system				
5.3 sewerage	BPW, MWSS			
5.3.1 number of households and persons engaged according to sanitary facilities (public sanitary, communal septic tanks, pit privies, etc.)				
5.3.2 degree of pollution				
5.3.3 number of establishments engaged in waste water system (MWSS, Ayala, central service, community systems) and number of persons served and and place		Table 2.4 Areas Covered and Population Served by Several Types of Sewerage Systems (Source: MWSS) Table 2.5 Population Density by Catchment Basin, 1980 (Source: MWSS)		
5.4 flood control and drainage	BPW, MWSS			
water flow pattern to the different rivers				
5.5 power	MERALCO, NPC			
5.5.1 amount in power consumptions according to users (residential, commercial, industrial)				

Information Available	Sources*	Tabulated Data, Year(s) Covered, and Sources	Maps, Year(s) Covered, and Sources	Charts/Graphs, Year(s) Covered, and Sources
5.5.2 number of power generating plants and power production capabilities according to sources (hydro, thermal, geothermal)		Table 2.6 NPC Generating Plants Luzon Grid, as of January 1982 (Source: NPC)		
5.5.3 power network system characterized by number of substations and transformers, and current distribution				
5.6 telecommunications				
5.6.1 telephone services number of subscribers classified according to users (residential, commercial, industrial, etc.) and location	PLDT			
5.6.2 telegraph services number of telegraph classified according to carriers (BUTEL, PCPI, PT & T) volume of telegraph service	NTC, BUTEL			

Information Available	Sources*	Tabulated Data, Year(s) Covered, and Sources	Maps, Year(s) Covered, and Sources	Charts/Graphs, Year(s) Covered, and Sources
5.6.3 postal services	BOP			
number of post offices and location		Table 2.7 Number of Drop Boxes by Post Office Location, 1980 (Source: BOP)		
5.6.4 radio and television service	KBP			
number of broadcasting stations according to economic activity (FM, AM, coastal, maritime, aircraft, ship, amateur radio stations)				
6. Social Services				
6.1 housing	NHA, MHS			
6.1.1 number of slums and depressed areas with its population type of dwellings (barong-barong, light material houses)		Table 2.8 Number of Dwelling Units, 1970-80 (Source: MMETRO-FINDS) Table 2.9 Total No. of Unacceptable Dwellings, 1980		

Information Available	Sources*	Tabulated Data, Year(s) Covered, and Sources	Maps, Year(s) Covered, and Sources	Charts/Graphs, Year(s) Covered, and Sources
6.2 health and nutrition	MSSD, MOH, MMC, HOC, NNC, FNRI			
6.2.1 death rates according to causes		Table 2.10 Leading Causes of Morbidity by Group, 1977 and 1980		
6.2.2 number of physicians, nurses, midwives, dentists and its ratio to population				
6.2.3 number of hospitals and health centres and its location			Fig. 2.12 Location of Health Facilities in the NCR	
6.2.4 rate of malnutrition by age				
6.3 education	MECS			
6.3.1 number of schools by location				
6.3.2 enrollment pattern and number of enrollees classified by level of education (elementary, secondary, tertiary), type of schools (private, government), and type of education (vocational, medical, science, engineering, etc.)				

Information Available	Sources*	Tabulated Data, Year(s) Covered, and Sources	Maps, Year(s) Covered, and Sources	Charts/Graphs, Year(s) Covered, and Sources
6.4 public safety				
6.4.1 crime rate				
6.4.2 number of fires by causes (electrical, etc.) and fire victims				
6.4.3 number of fire stations and ratio of fireman to population				
6.4.4 number of available facilities (firetrucks, hydrants, and alarm systems)				
6.5 parks and recreation				
number of parks with its land; area and location				
FRAMEWORK FOR DEVELOPMENT				
7. Problem Areas			Fig. 3.1 Problem Area Map	
8. Urban Growth and Development			Fig. 3.2 Phases of Development	
DEVELOPMENT OBJECTIVES AND POLICIES				
9. Population		Table 4.1 Population Projections -1983, 1987, 1992		

Information Available	Sources*	Tabulated Data, Year(s) Covered, and Sources	Maps, Year(s) Covered, and Sources	Charts/Graphs, Year(s) Covered, and Sources
10. Economy		Table 4.2 Employment Projections (Source of basic data: NCSO)		
11. Infrastructure and Utilities		Table 4.3 Programmed Level of Investment: Transportation 1982-87 (Source: BOT) Table 4.4 Estimated Potential and Actual Demands: Water (Source: MWSS) Table 4.5 Programmed level of Investment: Water 1982-87 Table 4.6 Wastewater Flows and Peak Flows (in Min. 1.25 and Max. 2.5 Peak Factors per Catchment Basin (Source: MWSS)	Fig. 4.1 Major Transport Projects Fig. 4.2 Water Supply and Distribution Projects Fig 4.3 Sewerage Projects Fig. 4.4 Drainage, Flood Control and Environmental Sanitation Projects	

Information Available	Sources*	Tabulated Data, Year(s) Covered, and Sources	Maps, Year(s) Covered, and Sources	Charts/Graphs, Year(s) Covered, and Sources
		Table 4.7 Programmed Level of Investment: Severage 1982-87		
		Table 4.8 Programmed Level of Investment: Flood Control and Drainage 1982-87		
		Table 4.9 Programmed Level of Investment: Environmental Sanitation NCR, 1982-87		
		Table 4.10 Mwh Sales Forecast by Municipality 1983-89 (Source: MERALCO)		
		Table 4.11 Programmed Level of Investment: Power 1982-87 (Source: MERALCO)		
		Table 4.12 Telecommunications 1983-90 (Source: PLDT)		

Information Available	Sources*	Tabulated Data, Year(s) Covered, and Sources	Maps, Year(s) Covered, and Sources	Charts/Graphs, Year(s) Covered, and Sources
		Table 4.13 Programmed Level of Investment: Telecommunications 1982-87 (Sources: BOP, BUTEL, NTC)		
12. Social Services		Table 4.14 Demand for New Dwelling Units 1983 and 1987 (Source: NHA)	Fig. 4.5 Public Shelter Programme	
		Table 4.15 Programmed Level of Investment: Housing		
		Table 4.16 Health and Nutrition Projections 1983-92 (Source: Health Operations Centre, MMC)		
		Table 4.17 Projected School Participation Rates by Level (Source: MEC)		
		Table 4.18 Teacher/Classroom Requirements by Level 1983-92		

Information Available	Sources*	Tabulated Data, Year(s) Covered, and Sources	Maps, Year(s) Covered, and Sources	Charts/Graphs, Year(s) Covered, and Sources
DEVELOPMENT ADMINISTRATION				Fig. 5.1 Sectoral Allocation of Projects by Government Level Fig. 5.2 The RDFP Process

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*Sources

BOL - Bureau of Lands
BOP - Bureau of Posts
BPW - Bureau of Public Works
BOS - Bureau of Soils
BUTEL - Bureau of Telecommunications
BOT - Bureau of Transportation
FNRI - Food and Nutrition Research Institute
KBP - Kapisanan ng mga Brodkaster sa Pilipinas
MERALCO - Manila Electric Company
MWSS - Metropolitan Waterworks and Sewerage System
MECS - Ministry of Education, Culture and Sports
MMC-HOC - Metro Manila Commission's Health Operations Centre
MOH - Ministry of Health
MHS - Ministry of Human Settlements
MOLE - Ministry of Labour and Employment
MSSD - Ministry of Social Services and Development
MOTC - Ministry of Transport and Communications
MOT - Ministry of Tourism
NEDA - National Economic and Development Authority
NCSO - National Census and Statistics Office
NEPC - National Environmental Protection Council
NHA - National Housing Authority
NNC - National Nutrition Council
NPC - National Power Corporation
NPCC - National Pollution Commission
NTC - National Telecommunications Commission
OCP - Office of the Commissioner for Planning
PLDT - Philippine Long Distance Telephone Company
PNR - Philippine National Railways

APPENDIX B. LAND USE AND ZONING PLAN PROCESS AND INFORMATION SYSTEM

Stages	Responsible Organization	Users	Information Needs	Information Available	Sources (Office/Document)	Data Management/ Methodology
I. Formulation	MM Zoning Administrator LRMS-OCP-MMC Local Zoning Review Committee	OCP-MMC Line Agencies MHS-HSRC Local governments development planning officer, local engineer, business licensing officer	Goals and objectives of the community with respect to physical development	Problems, goals, objectives and pattern of growth	RDFP	Consultation meetings Public hearings
			Development Strategies and pattern of growth Development priorities and land use schemes Programmes affecting land use - housing and resettlement programme - transportation and communication network system - space utilization programme - commercial and industrial projects, etc. - implementation scheme Financial Plan	Physical and spatial strategies for development: - definition of areas where certain types of development should be encouraged and other areas which should be conformed to. Examples: a) priority areas for development: (locational reference for the 245 proclaimed areas for priority development and urban land reform zones, adopted by the MHS Board through Resolution No. 25, 1 June 1983; b) restoration and administration of Intramuros Area; etc.	LRMS-OCP-MMC Primer on Land Use and Zoning Metropolitan Manila Area MHS Locational Reference Handbook Presidential Decree 1616, creating the Intramuros Admin.	Mapping Field Surveys Interdisciplinary team of planners, sociologists, and economists

Stages	Responsible Organisation	Users	Information Needs	Information Available	Sources (Office/Document)	Data Management/ Methodology
			Maps: Land use map Zoning map Structure map Vulnerability map Cadastral surveys, tax maps, Barrier maps, etc.	- identification of points of critical linkage and opportunities - rationalization of land use allocation		
				Locational guidelines for specific project types: market, funeral parlor, parking areas, etc.		
				Zoning regulations covering: - definition of words and phrases - zoning district boundaries - list of permitted uses	MMC Zoning Ordinance No. 81-01	
				Ongoing programmes and projects in MMC: - transport network and mobility linkages - building construction activities - quality of community services and facilities	RDFP/CIP	
				- budget of MMC, specifically LRMS	OCP	

Stages	Responsible Organization	Users	Information Needs	Information Available	Sources (Office/Document)	Data Management/ Methodology
			Maps: Land use map (11:25,000) Integrated Zoning map (1:25,000) Zoning maps (19) by city/mun. (1:10,000) Structure map (1:25,000) Total vulnerability grid map (1:25,000): - flooding caused by rainfall (1:25,000) - geological map (1:25,000) - fault and hard layer contour line (1:25,000)	LRMS, local governments, Bureau of Coast and Geodetic Survey, etc.		
			Land use/zoning proposals from local governments	Local governments		

Stages	Responsible Organization	Users	Information Needs	Information Available	Sources (Office/Document)	Data Management/ Methodology
II. Implementation	LRMS-OCP-MMC Local governments	LRMS-OCP-MMC Local governments	Systems and Procedures Implementation Scheme Financial Plan Organizational Arrangements Institutional Linkages Regulatory Measures	Systems and procedures in assessing and evaluating locational viabilities of all establishments Implementation scheme Regulatory measures Capital budget - (personnel, resources, etc.) Institutional responsibilities/linkages and functions	MMC Zoning Ordinance Manual of Operations OCP LRMS Organizational Chart Local governments	
III. Monitoring and Evaluation	LRMS-OCP-MMC MM Zoning Administrator Local Zoning Admin.		Effects of the plan on community Satisfactory achievements Problems and difficulties encountered in implementation Enforcement data Locational viability	Enforcement and compliance data on: - projects issued locational clearances whether favourable or denied - those issued with temporary use permits (TUP), variance, exceptions, certificates of conformance and nonconformance	LRMS monitoring maps LRMS monitoring reports LRMS-OCP-MMC Applications for locational clearance Monthly reports from local governments	Summary and development trend analysis based on applications for locational clearance Field survey inspections; foot, windshield, and "felt" observations

Stages	Responsible Organization	Users	Information Needs	Information Available	Sources (Office/Document)	Data Management/ Methodology
				- clearances previously issued by agencies in accordance with earlier Zoning Ordinance - complaints filed with the office Reasons for trends of the above enforcement and compliance data		Monitoring map with accompanying index card Analysis of administrative records
IV. Review/ Revision of Zoning Map and Ordinance	LRMS-OCP-MMC Local Zoning Review Committee		Monitoring and evaluation output	Monitoring and evaluation output	Local government proposals LRMS-OCP-MMC	Field survey Committee, deliberation/consultation meetings Public hearings

APPENDIX C. DATA FORMAT AND STANDARDIZATION FOR CITY/MUNICIPAL PROFILE ANALYSIS (AS PART OF THE LOCAL DEVELOPMENT PLAN)*

Topic/Area	Input/Sources	Outputs	Purpose
1. Location and General Description	Location map Data from socioeconomic profile MHS standards	Description of general location, orientation, size of area and its function Location map Issues	To describe location of the municipality/city To isolate issues concerning location, size, function with respect to MMA
2. Demography	1970, 1975, and 1980 NCSO data on population Municipality/city map with scale 1:10,000	Demographic indicators Issues Population density map by barangay	To analyse demographic data and assess significance of findings and issues raised
3. Physical Features			
3.1 Land Use	Physiographic map (MMC, Bureau of Soils) Slope map (MMC, Bureau of Coasts and Geodetic Survey) Natural Drainage Map (including rivers and streams, MMC, Municipal Map	Tables on Potentials for Urban Development by Barangay/Category Tables on Land Use Allocation Table on Land Use Policies Potential Land Use Map Write-up on Related Issues	To describe the municipality's existing land use pattern and determine potentials for further development To define appropriate land use policies

*Source: Integrative Planning Services, Guidelines for the Preparation of City/Municipal Development Plan.

Topic/Area	Input/Sources	Outputs	Purpose
	Flood-prone Areas Map (MMC, MWSS, MPWH, Laguna Lake Development Authority Earthquake-prone Areas Map (MMC, PAGASA) Existing Land Use Map (Mun.) Physical Standards: A Planning Guide (MMC, Preliminary)		
3.2 The Urban Environment	Water and atmospheric pollution indices (NEPC, NPCC, LLDA) Groundwater data (MPWH, NWRC, LLDA) Map of garbage dump sites (ESC, MMC) Existing land use map	Environmental map Environmental Indicators (Table on State of Water Bodies, Table on Underground Water, Table on Atmospheric Pollution Indices by Location) Write-up on environmental issues	To determine the quality of the municipality's environment
3.3 Urban Form	Land use map Municipality/City Zoning Ord. Potential land use map	Write-up on the municipality's/city's urban form	To define and discuss issues concerning urban form
3.4 Infrastructure	Land Use Map Output of Land Use Analysis Output of Pop. Analysis Planning Standards Inventory of infrastructure facilities by location	Tables on Inventory of Roads and Bridges, Inventory of Power Facilities, Power Consumption, Inventory of Water Facilities, Water Consumption 1975 and 1980	To define and discuss issues concerning transport, power, water, flood control, and drainage and sewerage

Topic/Area	Input/Sources	Outputs	Purpose
		Map showing location of postal and telegraph offices. Map showing main telephone distribution lines Write-up on all of the above and analysis of situation	
4. Industry, Commerce, and Services	Socioeconomic Profile NCSO Consistency Tables City/Municipal Survey of Industrial/Commercial Establishments		To describe the existing level of industrial and commercial services activity taking place in the city/municipality. To define the industrial and commercial potentials of the city/municipality To examine the effects of industrial and commercial development in the context of the environment, immigration, congestion, and revenue generation
5. Agriculture and Fishery	Data from Socioeconomic Profile NCSO Consistency Table 1971 Census of Agriculture	Subsectoral write-up of the existing situation, issues, and potentials Tables on Crop Production, Livestock/Poultry Farms, Fishing Activity, Fish Farming Activity	To describe the extent of agricultural activities in the municipality

Topic/Area	Input/Sources	Outputs	Purpose
6. Employment	Socioeconomic Profile Demographic Profile Set	Write-up describing the present employment situation Analysis of significant findings	To assess the existing employment situation prevailing in the city/municipality vis-à-vis the NCR and the country
7. Income	NCSO Consistency Tables NCSO Income Survey City/Municipal Income Survey	Write-up on the existing income situation Amplification of income-related problems and issues Tables on Annual Income Level of City/Municipality, Number of Families by Income Level, Number of Families, Net Income, and Average Income, by Source	To analyse the present income structure of the city/municipality and compare with the NCR and country
8. Housing	SEP Data 1980 NCSO data Municipal Data	Table on dwelling units by type of construction materials Table on current and projected housing requirements Write-up on existing and future housing situation	To determine housing situation in the city/municipality by estimating housing backlog and future housing need
9. Health and Nutrition	Health data from MOH, MMC, HOC, City/Municipal Health Office Data from Income Profile Set (Activity 7)	Table showing existing number of health institutions, personnel, and facilities	To describe the health and nutrition condition of the city/municipality

Topic/Area	Input/Sources	Outputs	Purpose
	Data from NNC NCSO population data MSSD data on depressed barangays	Table presenting the 10 causes of morbidity and mortality including rates per 1,000 population Table showing operation timbang institutions Map showing location of health institutions Write-up on existing health situation of the city/mun. Write-up on health and nutrition issues	
10. Social Welfare	Data from Income Profile Set Data from Education Profile Set Data from Employment Profile Set Data from Health and Nutrition Profile Set	Write-up on the existing situation in terms of demand for social services and supply of these. "Demand" in this sense is not market-oriented that this component covers those who cannot afford to pay for essential services and therefore must be socially subsidized Table showing number of out-of-school youth, jobless persons, below total threshold and food-threshold, number of persons, number of malnourished (first degree, second degree, and third degree)	To present the existing situation in the city/municipality with regard to social welfare; in other words, the extent of social and economic underprivileged conditions within the locality To describe the activities and efficiency of organization and agencies that provide social welfare and community development programmes in the area

Topic/Area	Input/Sources	Outputs	Purpose
		Table showing number, location and nature of services offered by type of social welfare organisation	
11. Sports and Recreation	Data from Socioeconomic Profile	Table showing location, number, type, and condition of sports and recreational facilities, total land area occupied by each type of facility Write-up on sports activities and recreational facilities in the locality	To describe sports and recreational activities in the area
12. Protective Services	Data from Socioeconomic Profile Data from Police District Offices (Western, Northern, Eastern, and Southern) Data from Integrated National Police	Write-up on the protective services (Police and Fire) of the municipality Write-up of related issues	To describe the existing peace and order condition in the municipality, the protective services the population is provided, and issues related to them

Topic/Area	Input/Sources	Outputs	Purpose
		Inventory of Flood Control Structures and Facilities, Number of Telephone Sets Installed, 1975-80	
		Road/Street Map - showing traffic congestion points and proposed major road/rail/river projects	
		Map showing power generating facilities and substations and barangays unserved by electricity	
		Map showing water facilities and communities unserved by MWSS and MWSS water distribution facilities in the city/municipality	
		Map showing existing severage system and areas needing to be served	
		Map showing flooded areas and flood control facilities and structures and natural drainage system (rivers/streams)	

Chapter 11

INFORMATION SYSTEMS FOR PLANNING IN SEOUL METROPOLITAN REGION

An-Jae Kim

INTRODUCTION

Objectives of the Study

Effective decision making can only be carried out with the utilization of correct data and scientifically analysed statistics. Formerly, when social structures were less complex, relevant decisions could be made, based on experience and intuition alone. But present day decision making requires correct and plentiful data and information because modern socioeconomic structures have become increasingly complex and interrelated.

Data and information are indispensable for spatial development in urban and regional units. Such a necessity for information stems from the fact that urban and regional development is characterized by comprehensiveness with regard to the public interest, and thus its planning requires objective validity as well as scientific reliability. Development which is based on a plan formulated without sufficient and correct information will precipitate irrational and wasteful results.

The objectives of this study are to identify problems relating to information systems and to explore desirable ways toward developing information systems in urban and regional planning through investigation of information use, data collection and analysis, data management and distribution, and organization of information systems, with particular reference to the Seoul Metropolitan Region (SMR).

General Statistics of the Case Region

The Seoul Metropolitan Region is composed of the city of Seoul, the city of Inchon, and the province of Kyongki. The region is located in the centre of the Korean Peninsula, but in the northwestern corner of the Republic of Korea. It is bordered on the north by the Democratic People's Republic of Korea along the truce line, on the east by Kangwon Province, on the south by the two provinces of Chungbuk and Chungnam, and on the west by the Yellow Sea (see figure 39).

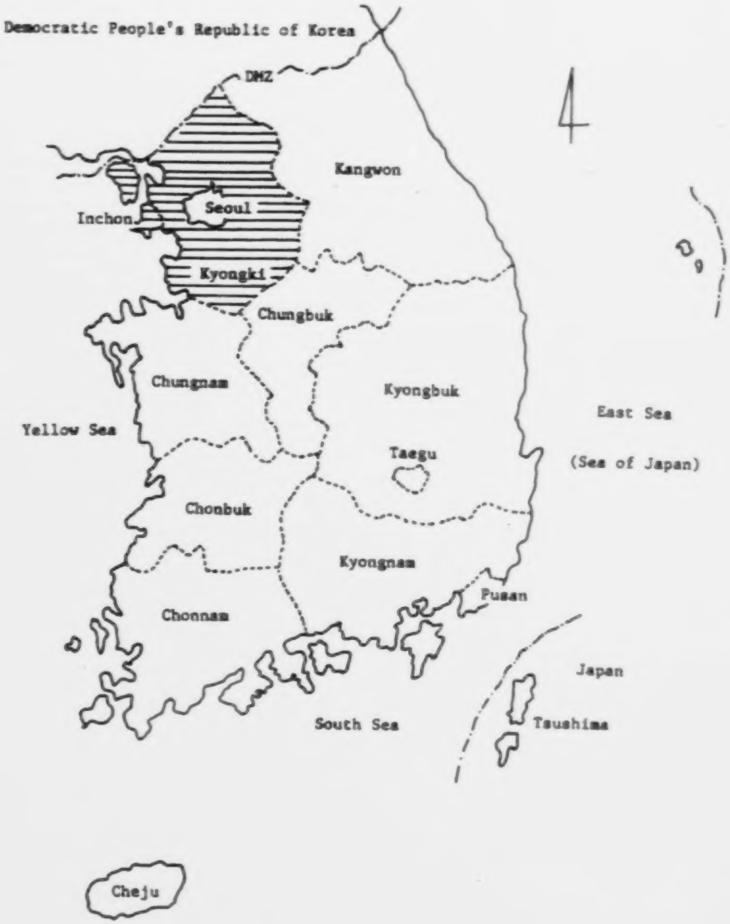
The region is 11,662 km^2 in area, with a population of 14.263 million as of 1982. From the fact that this area is only 11.8 per cent of the total national area while containing 36.3 per cent of the nation's population, it can be easily seen that the region is endowed with a densely concentrated population. The annual growth rate from 1975 to 1980 was 4.01 per cent in the region, which contrasted with the national average of 1.53 per cent. The gross regional product of the region was US$25.515 billion which represented 44.4 per cent of the gross national product in 1980. Thus, the per capita income of the region is much higher than the national average. Table 11.1 provides statistics of the region compared to the whole country.

TABLE 11.1. BASIC STATISTICS OF SEOUL METROPOLITAN REGION

	Area in km^2 (Jan.1984)	Population in thousands (Oct.1982)	Annual growth rate of population in per cent (1975–80)	Gross regional product US$million (1980)
Seoul Metropolitan Region	11,662	14,263	4.01	25,515
Seoul	605	8,916	3.96	17,800
Inchon	202	1,180	6.28	1,609
Kyongki Province	10,855	4,167	3.52	6,106
Total, Republic of Korea	99,022	39,331	1.53	57,429
Ratio (SMR/Korea) %	11.8	36.3	262.2	44.4

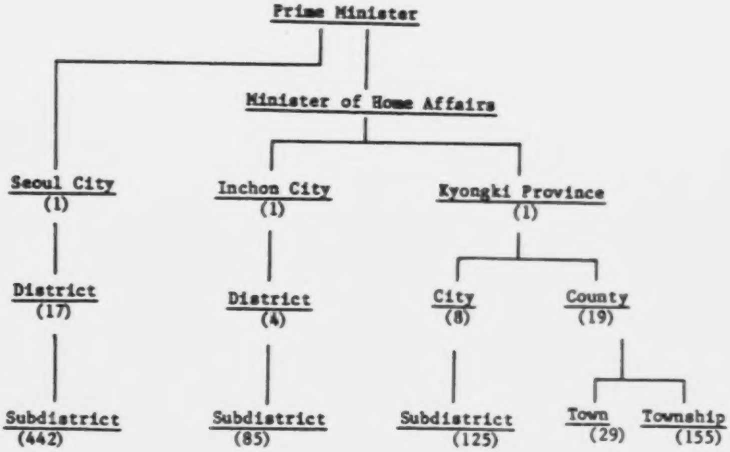
Source: Economic Planning Board, Korea Statistical Yearbook (Seoul, 1984).

Figure 39. Geographical location of Seoul Metropolitan Region


Democratic People's Republic of Korea
DMZ
4
Kangwon
Seoul
Inchon
Kyongki
Chungbuk
Chungnam
Kyongbuk
East Sea
(Sea of Japan)
Yellow Sea
Taegu
Chonbuk
Kyongnam
Pusan
Chonnam
Japan
South Sea
Tsushima
Cheju

In terms of the administrative system, the city of Seoul is controlled by the Prime Minister, and the city of Inchon and the province of Kyongki are under the direct control of the Minister of Home Affairs (figure 40). Kyongki Province has general cities and counties under its jurisdiction. Special and general cities, provinces, and counties have the legal status of local autonomous bodies. Kyongki Province is composed of eight cities and nineteen counties. Local autonomous bodies have subsidiary territorial organizations such as districts, subdistricts, towns, and townships within their jurisdictions. Seoul is divided into seventeen districts and 442 subdistricts, and Inchon is divided into four districts and eighty-five subdistricts. The eight cities of Kyongki Province consist of 125 subdistricts, and the nineteen counties of the province are composed of twenty-nine towns and 155 townships.

Figure 40. The administrative system of Seoul Metropolitan Region


Prime Minister
Minister of Home Affairs
Seoul City (1)
Inchon City (1)
Kyongki Province (1)
District (17)
District (4)
City (8)
County (19)
Subdistrict (442)
Subdistrict (85)
Subdistrict (125)
Town (29)
Township (155)

Note: 1/ Local autonomous body.
The numbers in parentheses represent the number of units.

Since Seoul is the capital city of the Republic of Korea, the Seoul Metropolitan Region plays the most important role in national political, administrative, socioeconomic, cultural, and educational activities.

Therefore, the region has a key position in determining various important issues, as well as spearheading the development of the nation.

DEVELOPMENT AND PLANNING SYSTEMS IN SEOUL METROPOLITAN REGION

Institutions for Development and Planning

The Ministry of Construction is the principal agency in the central government which deals with urban and regional development and planning in the Seoul Metropolitan Region. The Ministry legislates and operates the national and urban and regional development laws, establishes and implements national and regional plans, and approves and supervises urban and local plans drafted by the local governments. Although all of the bureaus in the Ministry of Construction are concerned with spatial development, the main bureaus are the Bureau of National Land Planning and the Bureau of Urban Affairs.

The Ministry of Home Affairs also has important functions for urban and regional development pertaining to general guidance and control of local administration. The Ministry has supervisory powers over the organization, personnel administration, and finance of local governments. Therefore, the Ministry is directly or indirectly concerned with urban and regional development and planning. Its main bureau directly concerned with urban and local development is the Bureau of Local Development. This bureau supervises all local governments except Seoul.

The autonomous local governments retain their primary responsibility for development planning and organization in their own areas. The principal organizations dealing with development planning are the Bureau of City Planning in Seoul and in Inchon, the Bureau of Construction in Kyongki Province, the Urban Affairs Section in the general cities, and the Construction Section in the counties.

Because urban or regional planning has such a profound effect on the population, various planning committees are organized at central and local governmental levels. These committees consist of relevant public officials, professional experts, and functional representatives. Committees linked to Seoul Metropolitan Region are the National Construction Comprehensive Planning Council (with the Prime Minister as chairman) under the President of the Republic of Korea, Capital Region Arrangement Inquiry Commission (with the Prime Minister as chairman), Central City Planning Committee (with the Minister of Construction as chairman) at the Ministry of Construction, and local City Planning Committees (with the Vice Mayor or Vice Governor as chairman) in Seoul, Inchon, and Kyongki Province, respectively.

Figure 41 shows the organization structure for urban and regional planning in Seoul Metropolitan Region.

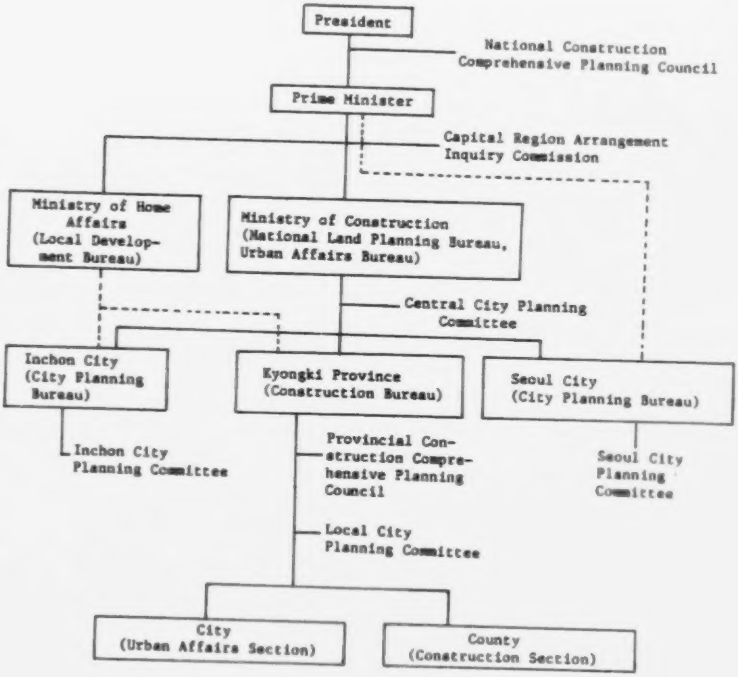
Development Plans

The National Land Comprehensive Development Plan is a plan originated at the highest level. The plan is prepared by the Ministry of Construction in accordance with the National Land Construction Comprehensive Planning Act. It sets basic principles and directions for spatial development of the whole country in keeping with the National Economic and Social Development Plan. The first ten-year plan was accomplished between 1972 and 1981, and the second ten-year plan (1982-91) is currently being carried out.

The master plan for Seoul Metropolitan Region is the Capital Region Arrangement Master Plan, of which the Capital Region Arrangement Planning Act of 1982 is the legal base. The Plan's major goals are to reduce the overconcentration of population and business in the Seoul Metropolitan Region and to induce a balanced development throughout the whole country within a period of twenty years. The first plan, which was formulated in 1984, with the year 2003 as its target for completion, contains policies on redistribution of population and industries, allocation of cities with a population of 50,000 and over, urban development, division and functionalization of subregions, environmental conservation, and construction of regionwide facilities. Actual implementation of the Master Plan will begin in 1985 with the establishment of the Capital Region Arrangement Implementation Plan which will have a completion target of ten years.

Each local government has its own development plan. The special cities (Seoul and Inchon), as well as the general cities and towns, devise a twenty-year term city master plan and a ten-year term city plan. The city master plan provides directions and indicators for long-range development, guidelines for city planning, and schemes for partial planning; the city plan consists of zoning, urban development facilities and projects, and partial implementation plans. The city master plan and the city plan are formulated on the basis of the City Planning Act. Kyongki Province and its counties have formulated a Provincial and the County Comprehensive Development Plans with a twenty-year time frame, based on the National Land Construction Comprehensive Planning Act. As of 1984, the Seoul city government was the only one which had established a Settlement Plan for each district. Figure 42 shows the development plans concerned with Seoul Metropolitan Region.

Figure 41. Development and planning institutions concerned with Seoul Metropolitan Region.


President
National Construction Comprehensive Planning Council
Prime Minister
Capital Region Arrangement Inquiry Commission
Ministry of Home Affairs (Local Development Bureau)
Ministry of Construction (National Land Planning Bureau, Urban Affairs Bureau)
Central City Planning Committee
Inchon City (City Planning Bureau)
Kyongki Province (Construction Bureau)
Seoul City (City Planning Bureau)
Inchon City Planning Committee
Provincial Construction Comprehensive Planning Council
Seoul City Planning Committee
Local City Planning Committee
City (Urban Affairs Section)
County (Construction Section)

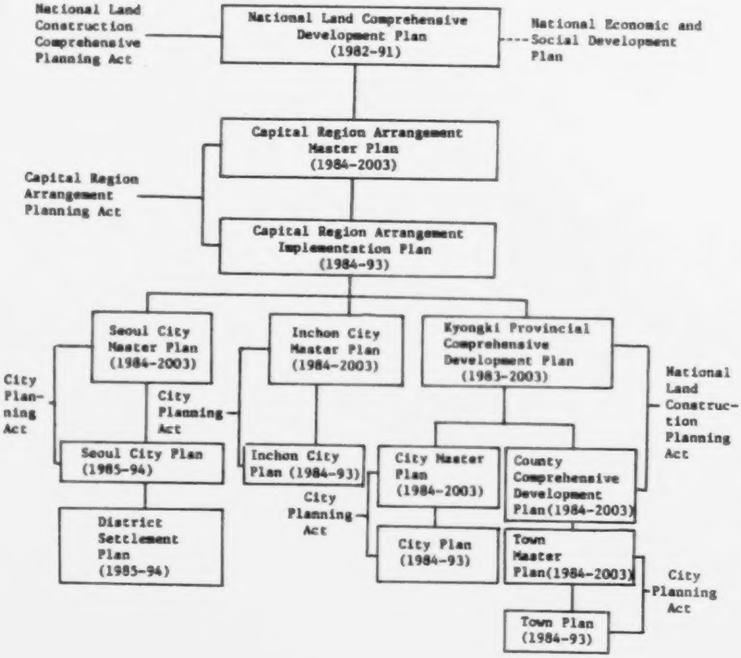


Figure 42. Hierarchical structure of development plans in Seoul Metropolitan Region

National Land Construction Comprehensive Planning Act
National Land Comprehensive Development Plan (1982-91)
National Economic and Social Development Plan
Capital Region Arrangement Master Plan (1984-2003)
Capital Region Arrangement Planning Act
Capital Region Arrangement Implementation Plan (1984-93)
Seoul City Master Plan (1984-2003)
Inchon City Master Plan (1984-2003)
Kyongki Provincial Comprehensive Development Plan (1983-2003)
National Land Construction Planning Act
City Planning Act
City Planning Act
Seoul City Plan (1985-94)
Inchon City Plan (1984-93)
City Master Plan (1984-2003)
County Comprehensive Development Plan(1984-2003)
City Planning Act
District Settlement Plan (1985-94)
City Plan (1984-93)
Town Master Plan(1984-2003)
City Planning Act
Town Plan (1984-93)

Procedures for Development Planning

The National Land Comprehensive Development Plan is drafted by the Minister of Construction, deliberated on by the National Construction Comprehensive Planning Council at a Cabinet meeting, approved by the President, and promulgated by the Minister of Construction. The Capital Region Arrangement Master Plan and its Implementation Plan are drafted by the Minister of Construction, deliberated on by the Capital Region Arrangement Inquiry Commission at a Cabinet meeting, approved by the President, and finally promulgated by the Minister of Construction.

The city master plan and the city plan are drafted by the mayor or head of the county, forwarded to the provincial governor, deliberated on by the Central City Planning Committee, approved by the Minister of Construction, and promulgated by the mayor or head of the county and the Minister of Construction, respectively. The Provincial Comprehensive Development Plan is drafted by the governor, forwarded to the Ministers of Home Affairs and Construction, deliberated on by the National Construction Comprehensive Planning Council, approved by the Prime Minister, and promulgated by the governor. The County Comprehensive Development Plan is drafted by the head of the county, deliberated on by the Provincial Construction Comprehensive Planning Council, approved by the governor, and finally promulgated by the head of the county.

The planning procedures are summarized in table 11.2.

INFORMATION USE IN DEVELOPMENT AND PLANNING

Information Use

Data or information for urban and regional development and planning and for the Seoul Metropolitan Region may be classified into the following ten categories: Natural environment, human resources, industry and economy, land and space use, network system, public utility, social welfare, education and culture, recreation and tourism, and public administration.

The main components of each are: Environmental conditions and natural resources in the natural environment category; size, structure, and distribution of population in the human resources category; industry, income, trade, and financing in the industry and economy category; urban distribution, village location, and land use in the land and space use category; transportation, communication, and energy in the network system category; housing, water supply, sewerage system, waste disposal, and marketing in the public utility category; medical

TABLE 11.2. PLANNING PROCEDURES FOR SEOUL METROPOLITAN REGION

Type	Name of Plans	(1) Draft	(2) Via	(3) Deliberation	(4) Approval	(5) Promulgation
National level	National Land Comprehensive Development Plan	Minister of Construction	- -	NCCPC/ cabinet meeting	President	Minister of Construction
Capital region level	Capital Region Arrangement Master Plan	Minister of Construction	-	CRAIC/ cabinet meeting	President	Minister of Construction
	Capital Region Arrangement Implementation Plan	Minister of Construction	-	CRAIC	CRAIC	Minister of Construction
City level	City Master Plan	Mayor or head of of county	Governor	CCPC	Minister of Construction	Mayor or head of county
	City Plan	Mayor or head of county	Governor	CCPC	Prime Minister	Governor
Provincial and county level	Provincial Comprehensive Development Plan	Governor	Ministers of Home Affairs and Construction	NCCPC	Prime Minister	Governor
	County Comprehensive Development Plan	Head of county	-	PCCPC	Governor	Head of county

Note: NCCPC = National Construction Comprehensive Planning Council
CRAIC = Capital Region Arrangement Inquiry Commission
CCPC = Central City Planning Committee
PCCPC = Provincial Construction Comprehensive Planning Council

facility, welfare facility, environmental protection, and disaster prevention in the social welfare category; schools, training facilities, and cultural and gymnastic facilities in the education and culture category; parks, recreation, and tourism in the recreation and tourism category; and organization, manpower, and finance of local governments in the public administration category. The categories and their related components are depicted in table 11.3.

Data for planning should be defined by geographic and time dimensions. Geographical boundaries will be determined by the territory subject to planning. Hierarchically, the geographic area of a plan can be classified into national, regional, local, or basic units. A regional unit would correspond to the Seoul Metropolitan Region; local units would be the city of Seoul, the city of Inchon, Kyongki Province, cities, counties, or districts; and basic units would be the towns, townships, or subdistricts. Data should be collected for each geographic unit to fit its particular planning needs. In terms of time, time-series data should be collected. The longer the span of time covered by the data, the more suitable it is for planning. To properly determine the trends of some ongoing phenomena, data covering ten to twenty years may have to be collected.

The information actually being used for urban and regional planning for the Seoul Metropolitan Region involves data items indicated in the corresponding planning laws and additional data necessary for development planning. Therefore, all the items listed in table 11.3 are an object of data collection for planning purposes. Macrolevel planning uses information predominantly related to economic development or public utilities, while microlevel planning employs information such as living conditions or welfare facilities. In terms of time frame, a span of ten years is generally used in data collection for current plans, whereas forecasting and planning increments will require data covering periods of five, ten, or twenty years.

Users and Suppliers of Information

Urban and regional information is used by institutions and persons having direct or indirect relationships with urban and regional development and planning. They include planners, inquiry members, authorizers, and executors. The first stage users are planners; the second stage users are inquiry commission members and authorizers; and the third stage users are executors (see figure 43).

TABLE 11.3. NECESSARY INFORMATION ITEMS FOR URBAN AND REGIONAL DEVELOPMENT PLANNING

Category	Components	Items
Natural environment	. Environmental condition	location, area, topography, climate
	. Natural resources	land, water, forest, mineral
Human resources	. Population size	scale, trend, ratio, growth rate
	. Population structure	sex, age, industrial and professional employment, education, income, household size
	. Population distribution	migration, distribution, density
Industry and economy	. Industry	products, number of firms, area of factories
	. Accounting	GRP, regional product, income distribution
	. Trade	exports, imports, money flows, manpower movement
	. Finance	financing, insurance
Land and space use	. City and village location	urban hierarchy, urbanization, spatial structure, village distribution, interregional linkage
	. Land use	classification by use, usable land
Network system	. Transportation	transportation mode, network, traffic volume, facility
	. Communication	telephone, telegram, mail
	. Energy	electricity, oil, coal, gas

(TABLE 11.3 continued)

Category	Components	Items
Public utility	. Housing	houses, housing demand and supply, housing scale, housing type
	. Water supply	water demand and supply, facility
	. Sewerage system	sewerage demand and supply, facility
	. Waste disposal	garbage, night soil disposal system, facility and manpower
Social welfare	. Medical facility	hospitals, medical care, manpower, number of patients, catchment area
	. Welfare facility	subjects for welfare, facility, low-income group
	. Pollution protection	pollution situation, pollution protection facility and manpower
	. Disaster prevention	disaster trends, disaster prevention facility, traffic safety facility
Education and culture	. Education	schools, students, teachers
	. Culture	library, theater, museum, religion, cultural assets
	. Gymnastic facility	users, facility
Recreation and tourism	. Parks	park, beach, public ground, users
	. Tourism	tourists, facility, revenue, manpower
Public administration	. Administration	boundary, function, organization, manpower, equipment
	. Finance	revenue, expenditure, investment

There are basically two types of information suppliers — one casual and the other formal and professional. The first type, often an information user, takes most of his data from compiled sources and occasionally gathers raw data to fill in missing information as necessary. The second type, a person whose job is to gather statistical information, collates the collected data, and supplies summaries to the users. Generally, planners use the existing data collected by the professional data suppliers at the first stage and then collect additional data themselves where necessary. Figure 44 shows various types of information supply.

Figure 43. Information users in urban and regional planning

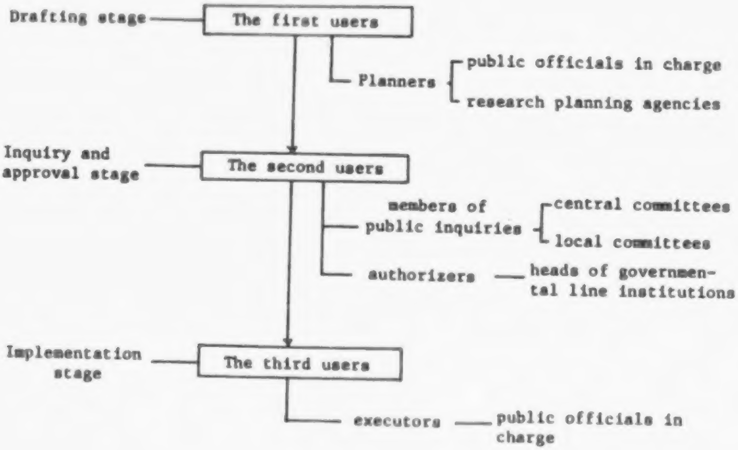
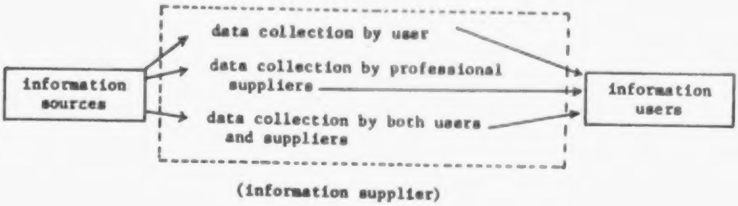

Drafting stage
The first users
Planners
public officials in charge
research planning agencies
Inquiry and approval stage
The second users
members of public inquiries
central committees
local committees
authorizers
heads of governmental line institutions
Implementation stage
The third users
executors
public officials in charge

Figure 44. Information supply system


information sources
data collection by user
data collection by professional suppliers
data collection by both users and suppliers
information users
(information supplier)

Gaps between Information Demand and Supply

The statistics for the nation as a whole are available to a satisfactory degree, but subregions and local units are facing a shortage of essential information. Baseline data for plan formulation are generally available, but there is a shortage of data needed for the plan implementation, monitoring, and evaluation stages. Local administrations (cities, counties, towns, townships, districts, or subdistricts) are at present unable to provide adequate regional economic information (i.e., industrial production, employment, per capita and per household income, interregional goods and service flows, or money flows). Additionally, there is a large gap between information demand and supply in the recreation and tourism sector.

Often the information being used is derived from data covering only the past five years. Data covering a ten-year period is difficult to find and causes problems for planners. The greater the area, the more general the contents, or the more recent the time span for which data is needed, the simpler is information gathering and usage; conversely, the smaller the area, the more specific the contents, or the more distant the time span, the more difficult is information collection and utilization. Table 11.4 illustrates possible data use according to subject area, spatial units, and time span.

Problems in Information Use

There are five problems in information use for development and planning in Seoul Metropolitan Region. The first is the imbalance between large demand and inadequate supply of statistical information. Regardless of the urgency for information for planning, implementation, or evaluation, the requested data cannot be fully provided. The situation is worse in regions far from Seoul Metropolitan Region. The major areas for which there is an information shortage are natural resources, economic activities, goods and service flows, and manpower movements. Lack of information hampers the precision, objectivity, and reliability of development plans, because plans that are formulated with incomplete information are divorced from the real situation, difficult to implement, and inconsistent in time flow.

TABLE 11.4. POSSIBLE LEVEL OF DATA USE IN URBAN AND REGIONAL PLANNING

Subject area	Spatial Units					Time span		
	Country	Region	Province	City & County	Town & Township	within 5 years	5-10 years	more than 10 years
Natural environment	0	0	0	0		0		x
Human resources	0	0			x	0		x
Industry/economy	0				x			x
Land use	0	0	0	0		0	0	
Network system	0	0	0	0		0	0	
Public utility	0	0	0	0		0		
Social welfare	0	0	0	0	0	0	0	
Education/culture	0	0	0	0	0	0	0	
Recreation/tourism					x			x
Public administration	0	0	0	0		0	0	

Note: 0 : higher utilization (80-100%)
: common utilization (50-80%)
: lower utilization (0-50%)

The second problem concerns the accuracy and consistency of the information. It is obvious that the real value of information depends on its authenticity. Occasionally it is found that data provided will not only be inconsistent with reality, but it can also differ according to which information source is used. This problem is particularly severe in such sectors of the economy as industry, income, employment, social structure, environment, land use, and land price. For example, the data relating to air and water pollution in and around Seoul provided in governmental publications and by private institution reports often differ. The possible sources of such information are the Ministries of Construction, Agriculture and Fishery, Trade and Industry, and Home Affairs, the Bank of Korea, or research institutions.

Thirdly, lack of concrete data is a problem in information use. Urban and local development planning requires concrete and detailed information covering space, time, and subject area. Most data cover national, regional, and city units in space, annually or on a five-year basis in time, and first and second order categories in subject area. However, detailed data is not fully available at the subunit level (county, town, township, and village) in space, on an annual or semiannual basis in time, and at higher-order category in subject area. Lack of concrete information prevents planners from formulating real and viable plans.

The fourth problem is the weak linkage between users and suppliers of information. Existing or newly collected data do not usually meet users' requirements in both subject area and form. This is due to the fact that users and suppliers function independently without cooperation or linkage.

Restricted accessibility to information is another important problem. Since government-collected data are distributed to a limited number of clients through formal channels, it is very difficult for people outside these channels to have access to data. Data and information which have restricted accessibility are generally those relating to environmental pollution, residents' income levels, and landownership.

DATA COLLECTION, ANALYSIS, AND MANAGEMENT IN DEVELOPMENT PLANNING

Types of Data Collection

Two types of data collection processes are usually applicable to urban and regional planning (figure 45). One is regular collection, and the other is temporary collection. Regular collection refers to periodic and cyclical collection of data for general purposes; temporary collection refers to occasional, *ad hoc* collection of data for special use or purpose.

The regular collection type is further classified into two subtypes, viz., designated or nondesignated collection. This classification is made according to whether or not the data collected is that designated by the Bureau of Research and Statistics or the Economic Planning Board under the Statistical Act. There are also two subtypes of the temporary collection type. One is obligatory collection in which data collection is regulated by related laws, and the other is voluntary collection in which planners may collect data according to their needs.

Collection of about 332 types of statistics has been directed by the government as of 31 January 1983, with seventy-nine institutions involved in the task. Of these, 148 types of statistics are being used in urban and regional planning, which represents 44.6 per cent of the total. Of these 148 types, 107 are collected by seventeen central government agencies, while thirteen local governments collect nineteen types (see table 11.5), and fourteen other designated institutions collect twenty-two types.

Figure 45. Types of data collection

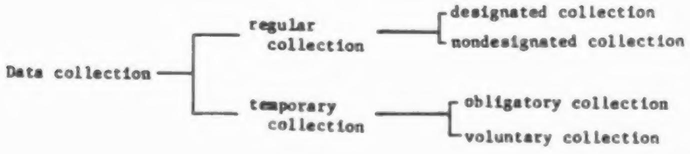

Data collection
regular collection
temporary collection
designated collection
nondesignated collection
obligatory collection
voluntary collection

TABLE 11.5. NUMBER OF DESIGNATED INSTITUTIONS AND STATISTICS

	All fields(A)		Urban-regional planning field(B)		Ratio (B/A) per cent	
	Institutions	Statistics	Institutions	Statistics	Institutions	Statistics
Total	79	332	44	148	55.7	44.6
Governments	38	240	30	126	78.9	52.5
Central	25	220	17	107	68.0	48.6
Local	13	20	13	19	100.0	95.0
Others	41	92	14	22	34.1	23.9

These statistics can be categorized into specified statistics and general statistics according to the characteristics of their collection. The 148 types of statistics related to urban and regional planning are divided into twenty-seven specified statistics and 121 general statistics. By methods of data collection, the statistics are classified into survey statistics and report statistics. The former consists of statistics collected through field surveys, and the latter consists of statistics produced through reporting. The number of survey and report statistics are eighty-nine and fifty-nine, respectively (see table 11.6).

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TABLE 11.6. CLASSIFICATION OF DESIGNATED STATISTICS

	Number of statistics	By characteristics		By collection methods	
		Specified	General	Survey	Report
Total	148(100.0)	27(18.2)	121(81.8)	89(60.1)	59(39.9)
Governments	126(100.0)	27(21.4)	99(78.6)	73(57.9)	53(42.1)
Central	107(100.0)	26(24.3)	81(75.7)	55(51.4)	52(48.6)
Local	19(100.0)	1(5.3)	18(94.7)	18(94.7)	1(5.3)
Others	22(100.0)	-	22(100.0)	16(72.7)	6(29.3)

The period for the preparation of designated statistics varies from instantaneous to ten years. A one-year period is the most common, with fifty-two out of 148 types of statistics, followed by a monthly term, with forty-three kinds. Table 11.7 gives further details regarding the period covered by designated statistics.

TABLE 11.7. NUMBER OF DESIGNATED STATISTICS BY PERIOD

Period	Total	Governments			Others
		Subtotal	Central	Local	
Total	148(100.0)	126(100.0)	107(100.0)	19(100.0)	22(100.0)
10 years	4(2.7)	4(3.2)	4(3.7)	-	-
5 years	8(5.4)	5(4.0)	5(4.7)	-	3(13.6)
3 years	5(3.4)	5(4.0)	5(4.7)	-	-
2 years	1(0.7)	1(0.8)	1(0.9)	-	-
1 year	52(35.1)	39(30.9)	33(30.9)	6(31.6)	13(59.1)
half-year	19(12.8)	19(15.1)	6(5.6)	13(68.4)	-
quarterly	15(10.1)	15(10.1)	13(12.1)	-	2(9.1)
monthly	43(29.1)	43(29.1)	39(36.5)	-	4(18.2)
instantaneous	1(0.7)	1(0.7)	1(0.9)	-	-

Various fields of economic or social activities are covered in these statistics. As shown in table 11.8, the economic and industrial field is the largest, with sixty-three types constituting 42.6 per cent of the total, followed by the population and housing field with 28 types or 18.9 per cent of the total. Table 11.8 gives the classification of designated statistics by functional field.

TABLE 11.8. CLASSIFICATION OF DESIGNATED STATISTICS BY FUNCTIONAL FIELD

Field	Total	By characteristics		By collection methods	
		Specified	General	Survey	Reports
Total	148(100.0)	27	121	89	59
Population & housing	28(18.9)	5	23	28	-
Population	21(14.2)	4	17	21	-
Housing	7(4.7)	1	6	7	-
Economy & industry	63(42.6)	19	44	45	18
Economy	11(7.4)	4	7	8	3
Income	12(8.1)	2	10	9	3
Primary industry	18(12.2)	8	10	13	5
Secondary industry	13(8.8)	4	9	10	3
Tertiary industry	9(6.1)	1	8	5	4
Space and Construction	17(11.5)	2	15	6	11
National land	3(2.0)	-	3	1	2
City	2(1.4)	-	2	1	1
Construction	12(8.1)	2	10	4	8
Social overhead capital	18(12.1)	1	17	2	16
Transportation	15(10.1)	1	14	1	14
Communication	1(0.7)	-	1	-	1
Energy	2(1.3)	-	2	1	1
Social welfare	22(14.9)	-	22	8	14
Living condition	5(3.4)	-	5	2	3
Social welfare	17(11.5)	-	17	6	11

Data in most of these functional fields are easy to collect, but rather difficult for others (e.g., economy and industry, particularly income, money and commodity flows, and manpower movement). There is no problem in the field of space and construction, because data is generally collected through administrative channels. The field of social welfare is the most problematic for data collection, because it is rapidly changing and has a large number of data subject areas for which survey formats are not standardized.

The main agencies collecting statistical data are the Economic Planning Board, the Ministry of Construction, the Ministry of Agriculture and Fishery, the Ministry of Home Affairs, the Ministry of Trade and Industry, the Ministry of Social. Affairs, and the Ministry of Transportation at the national level; local autonomous bodies at the local level; and the Bank of Korea, Industrial Bank, Chamber of Commerce and Industry, research institutions, and a small number of public corporations.

Coordination in data collection is mainly conducted by the Bureau of Research and Statistics, Economic Planning Board through its preliminary review, approval, or postdeliberation processes.

Processes and Methods of Data Collection

Regular data is collected periodically at fixed points in time, while temporary data is gathered whenever a certain objective or necessity arises. Designated and specified data are collected regularly using survey formats approved by the Minister of the Economic Planning Board. These statistics are promulgated by the institution in charge after approval from the Minister of the Economic Planning Board. Apart from this case, other data is collected based on a format drawn up by the planner or surveyor himself according to his own specific objectives.

Three methods are generally used for data collection for urban and regional planning: Documentary survey, report survey, and field survey. In practice, any of these three methods may be used according to the particularities of each case. A field survey is conducted in order to obtain detailed and up-to-date information when existing statistics and/or reporting data are inadequate. The regular collection process requires report or field surveys, and the temporary collection process employs documentary and field surveys at the same time. Of the 148 types of regular and designated statistics, eighty-nine are collected by field survey and fifty-nine by report survey.

A field survey is conducted by means of observation, participation, interview, or distribution. Observation and participation are used for environmental fact-finding, and interview and distribution are used for investigation of the awareness and attitudes of residents. Regular collection uses interview and distribution, while temporary collection optionally employs observation, interview, or distribution.

The population and housing census and the mining and industrial census carry out a complete enumeration survey covering the nation or a designated region. All other fields use the sample survey method. Statistics from censuses are used for general purposes in spatial planning, but they have little use for specific purposes. They are not useful in small area planning, because they do not provide small area statistics. Sampling techniques in use are generally stratified sampling, cluster sampling, and systematic sampling. Sometimes, a purposive sampling technique is applied in the case of simple research.

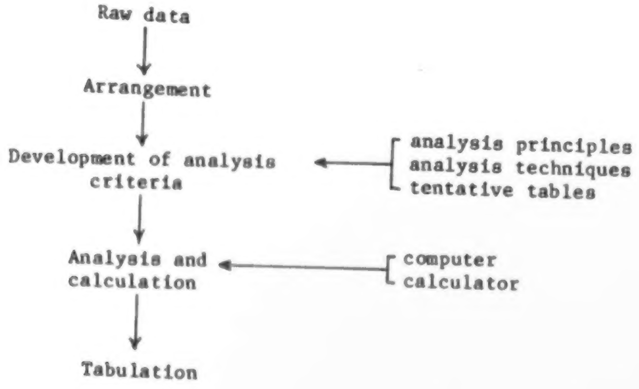
Analysis of Data

Collected raw data is arranged and analysed according to the objectives of the survey. The data from regular collection is fed into a computer and systematically arranged for general use. However, data from temporary collection usually must be thoroughly analysed for specific uses, and computer or an electronic calculator with detailed programmes is utilized. Figure 46 illustrates the data analysis process. Regular data collection requires different personnel and analysis, but it is generally identical to temporary data collection.

In urban and regional analysis and planning, data analysis is directed toward identifying trends, characteristics, problems, reasons, or factors. Trends constitute a basis for future projections, characteristics help a region to be identified, problems give information on the weakness of a region, and factors are utilized to formulate a development or improvement plan for the future.

In terms of subject area cross analysis, data from regular collection is analysed by a single analysis method or a simple cross analysis method, while data from temporary collection is analysed by concrete cross analysis for specific objectives. The field of urban and regional planning requires cross analysis because spatial planning requires the determination of the relationships among the factors.

Figure 46. Process of data treatment


Raw data
Arrangement
Development of analysis criteria
analysis principles
analysis techniques
tentative tables
Analysis and calculation
computer
calculator
Tabulation

Data analysis techniques frequently used in urban and regional studies and planning consist not only of statistical analysis methods but also utilize vector and matrix analysis, calculus and differential equations, input-output analysis, factor and cluster analysis, economic base study, regional shift-share analysis, industrial location and complex analysis, or regional accounting. Computers are utilized in data analysis, especially in such fields as transportation, population, economics, and industrial location.

Distribution and Management of Data

Distribution and Utilization of Data

There are two methods of data distribution: stationary and variable. Data from regular collection is distributed by stationary method, while data from temporary collection uses the variable method. Most institutions concerned with data collection and treatment have a list of data receivers and distribute data according to the list. The information distributed through institutions' mailing lists is principally data collected by censuses and periodic surveys. In this case, it generally takes the form of a published statistical yearbook or monthly statistical report. The distributed information is useful for planners, enabling them to make a general sketch at the initial stages of planning. The receiving organizations on the list are generally ministries of central government, local governments, relevant research institutions, relevant private firms and social groups, colleges, and professional clients. For the general public, government publication centres are operated in the large cities including Seoul.

Statistical data are preserved in data files, published reports, or computer storage. Data from regular collection use published reports and computers, and data from temporary collection use data files or published reports for their preservation. Most institutions have their own library or materials room for use and storage of data.

On some occasions, information regarding additional subject areas, new survey forms, subregional delineation, and complementary tables are required by planners and other data users. When there is a lapse of time between the period covered by available data and that in current demand, it is common to use the old data in spite of its deficiency, otherwise additional field survey is used to obtain more up-to-date information.

Monitoring and control of projects

Development projects are the actual means of implementing development plans. In a city or region, a comprehensive plan is formulated by a planning department, but individual projects are planned by functional departments under the comprehensive plan at a higher level.

A project department has the responsibility to accomplish, control, monitor, and evaluate the projects. The department appoints a project inspector who supervises the progress of the project.

Project evaluation is carried out at three stages, viz., advance, middle, and ex-post stages of the project. Pre-evaluation makes a feasibility study and prioritizes the projects; middle evaluation reviews and checks whether the project is progressing favourably under the original programme; post-evaluation analyses and evaluates the effectiveness of project outcome.

Project monitoring and evaluation under the Capital Region Arrangement Master Plan and its Implementation Plan are conducted by the corresponding city and county governments at the first stage, the governments of Seoul, Inchon, and Kyongki Province at the second stage, the Ministry of Construction at the third stage, and the Capital Region Arrangement Inquiry Commission at the final stage. The performance indicators in project evaluation are the effectiveness of population reduction in Seoul Metropolitan Region and the degree of population resettlement and/or population migration to outlying areas. Project success depends on governmental capability, policy and strategy consistency, and cooperation among governmental institutions.

Problems in data collection and management

There are many problems in data collection, use, and management for urban and regional planning. This is especially true in the Seoul Metropolitan Region. Data collection and analysis are weak, collection processes are not well formalized or systemized, collection methods are deficient in terms of scientific methodology, details and concreteness of data are not provided, interinstitutional linkage in data treatment is weak, and data analysis techniques are not standardized.

There are also problems in data distribution, viz., systems are ineffective and irregular, data management operates uneconomically and inefficiently, data accessibility to users is relatively restricted, and public officials in charge, as well as the general public, have a poor understanding of statistics and how to utilize the published information.

Finally, there are serious difficulties with project monitoring and evaluation systems. In cases where a project or programme does not accord with the higher general plan, or where a feasibility analysis is incomplete, monitoring and evaluation processes and methods are poorly developed. Also personnel in charge of inspection, monitoring, and evaluation often are not sufficiently qualified or experienced.

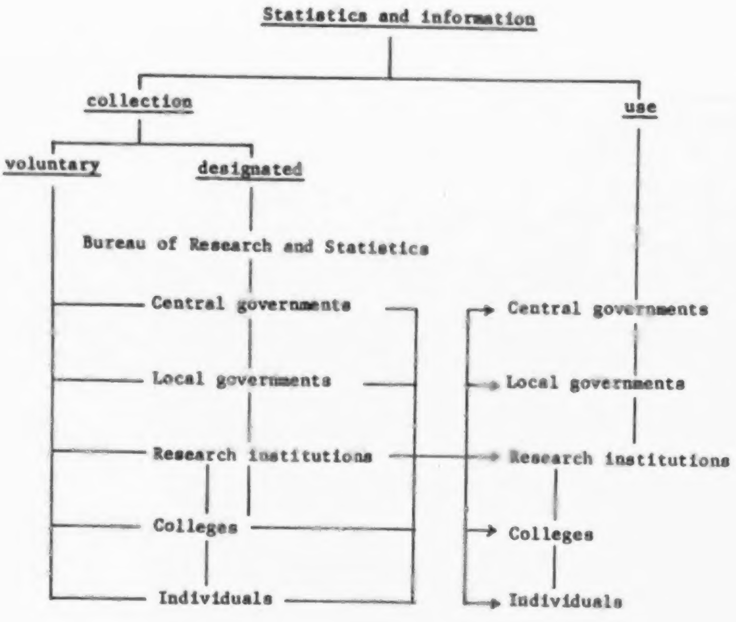
ORGANIZATION AND OPERATION OF INFORMATION SYSTEMS IN DEVELOPMENT AND PLANNING

Institutions for Data Collection

The institutions which collect, manage, and use statistical data for urban and regional planning fall into three groups, viz., central government, local government, and others. Among these institutions, seventeen in the central ministries, thirteen in local governments, and fourteen in other institutions carry out designated surveys. The principal organization in charge of statistical administration is the Bureau of Research and Statistics, Economic Planning Board. The Bureau designates survey institutions, prescribes and coordinates research formats and methods, and approves the collection of data.

The major institutions using urban and regional data for planning are the Ministry of Construction, the Ministry of Home Affairs, the Ministry of Agriculture and Fishery, and the Ministry of Trade and Industry in the central government, and all the 198 local autonomous bodies. Among other important clients using such data are public research institutions, such as the Korea Research Institute for Human Settlement, Korea Development Institute, Korea Rural Economic Research Institute, and Korea Advanced Institute of Science and Technology; research institutes attached to urban and regional planning departments of colleges; and private institutions dealing with urban and regional planning. Figure 47 shows the institutional system of data collection and use.

Figure 47. Institutional system of data collection and use


Statistics and information
collection
use
voluntary
designated
Bureau of Research and Statistics
Central governments
Local governments
Research institutions
Colleges
Individuals
Central governments
Local governments
Research institutions
Colleges
Individuals

Organization and Manpower

Each ministry of the central government has a statistics section under the Planning and Management Officer who is the third highest official in the ministry. Every province or special city has a statistics section under the Planning and Coordination Officer who is the third highest official in the respective government. These sections, which consist of two or three subsections, undertake the function of data collection, arrangement, management, distribution, and storage.

The head of the section in charge of statistical data holds the job classification of grade 4 in the central government, grade 5 in a special city or a province, and grade 6 in a general city and a county. Each section consists of five to ten staff members.

Research institutions usually have a research section, a data office, or a statistical analysis division which deals with statistical data and information processing.

Operation of Information Systems

Data from the regular and designated collection methods are processed through an agreement with the Bureau of Research and Statistics, Economic Planning Board. However, other data is voluntarily processed by an institution in charge. Data collected in a regular way is used as fundamental and standard statistics, while data collected irregularly functions as auxiliary statistics.

Although many national and local government offices (including those of Seoul, Inchon, and Kyongki Province) have a computer or terminal system, the operating efficiency of such is typically very low, because it is mainly used for general administration affairs, and has only a secondary function concerned with development and planning data.

Most officials in charge of data are generally deficient in their data collection, statistical analysis, or information management abilities. Such a situation exists due to a personnel administration system which has a high turnover rate and little guarantee of professionalism. Most officials hesitate to apply for jobs dealing with data because of lack of training in statistics.

An information system for the Capital Region Arrangement Master Plan has not yet been established. However, the Korea Research Institute for Human Settlement is currently collecting the necessary data, which will be computerized. The work will be finalized by the end of 1985 and become operational in 1986. The Institute is providing computer and statistical staff and makes use of consultants from the Korea Advanced Institute of Science and Technology, as well as the universities. Following the implementation of this system, useful information will be supplied to institutions or organizations related to the formulation of the master plan.

Environmental Change and Adaptation Process

The importance of information related to urban and regional development and planning was realized towards the end of the 1960s when urban and regional development started to become one of the principal policy issues in government. During the 1960s and 1970s, the overconcentration of population into the SMR, accompanied by unbalanced national growth, resulted from the government's policy of rapid industrialization. Such an undesirable situation underlined the importance of a balanced national development policy.

Thus, the First National Land Comprehensive Development Plan (1972-81) was established in 1971 and launched a year later. The Five-Year Economic Development Plans began to include the concept of spatial development after 1972. In the latter half of the 1970s, various development plans were formulated by regions, provinces, cities, and counties. The Second National Land Comprehensive Development Plan (1982-91), the Fifth Economic and Social Development Plan (1982-86), the Capital Region Arrangement Master Plan, and the City Readjustment Plans of each city all began in the early 1980s.

Changes in national policies and environmental conditions were followed by an expansion of concerned organizations and an increase in available information for development planning. The organizational status of planning sections was upgraded in the central and local governments; a statistics section was organized in every ministry, city, and province; professional research institutions were established in related fields; and new departments or colleges were created for urban and regional development and planning education.

Problems in Organization and Operation of Information Systems

The functions and personnel of organizations in charge of information are inadequate for effective implementation of information administration in urban and regional development. Therefore, collection, analysis, management, and use of information are not accomplished in a systematic and efficient way.

Another problem is the weak data communication linkage among institutions in charge of information or planning. Many institutions and organizations dealing with data, statistics, or information have little or no contact with each other. This situation causes duplication in data collection and analysis, inconsistencies among statistics of the same subject areas, waste of information budgets, and confusion in data use.

Data conservation is an additional problem. Because of dispersed management and single use of data, the preservation of time-series data is not realized in most governmental and private institutions. This makes historical records and past data difficult to acquire.

A final problem may be due to a defect in personnel administration. It is difficult for officials in charge of data treatment to become specialists in statistics and information and to acquire skill in data handling, because their turnover is so rapid and their understanding of information is insufficient. This is the reason why information systems are not fully effective and inadequately developed.

CONCLUSION

Prospects for the Future

In the Republic of Korea, the statistics and information needs in urban and regional planning will continue to increase, both in quantity and quality, in the future. Future trends in urbanization and localization will require further studies on the development and planning of the urban and regional sectors. The refocusing of priorities from nationwide to local units, from large cities to small and medium cities, and from comprehensive plans to component plans will require disaggregated statistics and systemized and accumulated information.

The population of Seoul and the Seoul Metropolitan Region is predicted to increase to 12 million and 17 million respectively by 1991 and to 16 million and 22 million respectively by the year 2001. This will give rise to many serious problems in Seoul and its surrounding region as well as in the whole country. In order to prevent this situation from occurring, relevant and positive policies should be formulated and implemented as countermeasures. Policies will have to include: Rearrangement and control of the development and growth of Seoul and its region; strengthening of the human settlement support bases in other regions; increased development of local economic and industrial activities, public utilities, and social welfare; stimulation of growth poles in other regions; and decentralization of national power to local governments.

In order to make policies and strategies effective, accurate and concrete information will have to be adequately accumulated and supplied to all concerned central and local government agencies and research institutions. It is thus vital that information systems for urban and regional development be developed to efficiently functional and productive levels.

New Directions for Information Systems

New directions for the future development of information systems may be examined from three aspects, viz., organization, data collection and analysis, and information management and use. Organizations must be developed and stabilized in advance, because they are crucial fundamental devices which affect the efficiency of an information system. Data collection and analysis which form the core of the information process should be developed to a level at which such data attributes as correctness, precision, timeliness, and usage are satisfactory. The process of data management and use must be efficient and convenient, because this process ultimately contributes to the accomplishment of the objectives of data collection.

In order to encourage the establishment of viable information systems, the following practices should be implemented. Firstly, a strengthening of the functions of statistical administration is required. In addition, organizations in charge of information require reorganization and expansion. A network of information systems should be installed throughout the country not only in a horizontally linked way among parallel organizations, but also in a vertically linked way among hierarchical organizations.

The process of data collection and analysis could be reinforced by a thorough systemization, scientification, and specialization. For systemization, statistical data needs a classification and itemization standard, while data collection and analysis should be carried out in an orderly way to increase efficiency. Data processing should be scientifically conducted following principles of accuracy and timeliness at all stages, particularly in the drawing up of survey formats, decisions on sample size, sample selection, training of surveyors, data collection, arrangement, and analysis, and tabulation of analysed data. Specialized data analysis should correspond to users' demand through relevant and representative techniques.

The system of data management and use could be made more efficient through coordination and cooperation among those processing data, conservation of time-series statistics and information, and increased accessibility to data for users engaged in planning and development as well as those studying urban and regional affairs.

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Chapter 12

INFORMATION SYSTEMS FOR PLANNING IN BANGKOK METROPOLITAN AREA

Kiat Chivakul

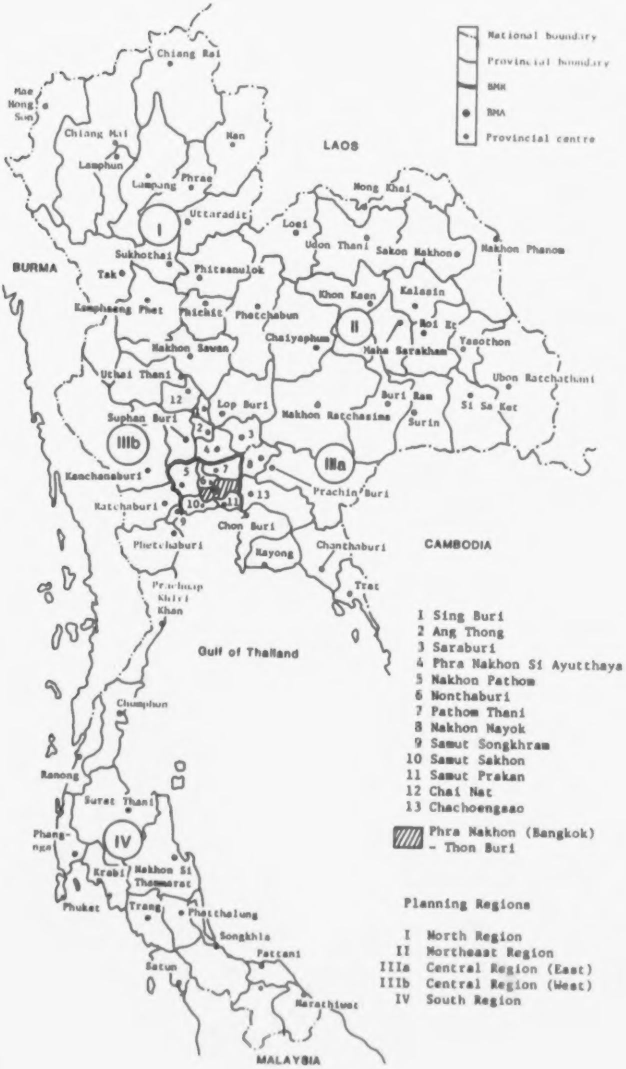
Thailand has developed rapidly over the past twenty-three years (1961-84), and the Fifth National Economic and Social Development Plan, 1982-86 is currently being implemented. It is however observed that urban and regional development is still not being given sufficient attention. Although there are policies to reduce the rate of growth of the Bangkok Metropolitan Area (BMA) and accelerate the development of other regions, only a small budget is allotted for those other and larger areas; hence, nothing happens which will effectively stop the growth of BMA.

The problems experienced in planning for BMA relate to matters concerning the need to coordinate regional and intermediate city development and improvements in poor rural areas (i.e., urban-rural linkages) in the national spatial development framework. The concentration of public and private sector investments in BMA induces its further growth. The rapid expansion of BMA without effective plan and control measures creates serious problems of high population density, improper land use, and inadequate building utilization.

The government recognizes these problems and it is expected that these will be considered in the preparation of the Sixth National Economic and Social Development Plan, 1987-91.

As the capital city and the centre of all activities at the national level, BMA attracts a large number of people. In 1981, some 5.3 million people (11.4 per cent of the whole population) were concentrated in BMA. BMA contributes about US$4,333.8 million (about 32.0 per cent) to the Gross National Product. The Bangkok Metropolitan Region (BMR) includes BMA and the vicinity, that area comprising the five adjoining provinces of Nonthaburi, Samut Prakan, Samut Sakorn, Pathum Thani, and Nakorn Pathom (figure 48). BMR's area is 7,621 km^2 or 1.5 per cent of the whole country; its population is 7.5 million or 15.6 per cent of the whole population; and it contributes about US$6,610.1 million or 42.5 per cent of the GNP.

Figure 48. Thailand and its regions


National boundary
Provincial boundary
BMR
BMA
Provincial centre
LAOS
BURMA
CAMBODIA
MALAYSIA
Gulf of Thailand
Chiang Rai
Mae Hong Son
Chiang Mai
Lamphun
Lampang
Phrae
Nan
Uttaradit
Sukhothai
Tak
Phitsanulok
Kamphaeng Phet
Phichit
Phetchabun
Nakhon Sawan
Uthai Thani
Chaiyaphum
Loei
Nong Khai
Udon Thani
Sakon Nakhon
Nakhon Phanom
Khon Kaen
Kalasin
Roi Et
Maha Sarakham
Yasothon
Ubon Ratchathani
Si Sa Ket
Surin
Buri Ram
Nakhon Ratchasima
Lop Buri
Suphan Buri
Kanchanaburi
Ratchaburi
Phetchaburi
Prachuap Khiri Khan
Prachin Buri
Chon Buri
Rayong
Chanthaburi
Trat
Chumphon
Ranong
Surat Thani
Phang-nga
Krabi
Nakhon Si Thammarat
Phuket
Trang
Phatthalung
Songkhla
Pattani
Satun
Narathiwat
I
II
IIIa
IIIb
IV
1
2
3
4
5
6
7
8
9
10
11
12
13
1 Sing Buri
2 Ang Thong
3 Saraburi
4 Phra Nakhon Si Ayutthaya
5 Nakhon Pathom
6 Nonthaburi
7 Pathom Thani
8 Nakhon Nayok
9 Samut Songkhram
10 Samut Sakhon
11 Samut Prakan
12 Chai Nat
13 Chachoengsao
Phra Nakhon (Bangkok) - Thon Buri
Planning Regions
I North Region
II Northeast Region
IIIa Central Region (East)
IIIb Central Region (West)
IV South Region

BMR's industrial products account for about 75.5 per cent of the whole industrial sector. These show that the capital city is a conglomerated area where industry and services are highly concentrated.

In relation to data management, the data for planning is dispersed throughout the old and new government institutions and the private sector. Most of the data is collected by the different agencies according to type, interest, and problem orientation. The integration of planning policies is achieved through vertical coordination, while the integration of implementation is achieved through horizontal coordination. There are ad hoc and permanent committees, ranging from the ministerial and businessmen's conferences to the departmental conferences inside and outside BMA.

INFORMATION NEEDS IN URBAN AND REGIONAL PLANNING

Most of the basic information needed for spatial structure analysis relates to socioeconomic development, and is divided into two categories.1/ One category consists of the following data elements:

a. area geography (location, soil conditions, and climate);

b. population (size, density, and age structure);

c. level of science and technology (size of firm); and

d. political and ideological thought (system of administration, economics, and general value judgement).

The second category consists of the following data elements:

a. relationship among the economic branches (size of activities and type of contractor);

b. condition of settlement and distribution of employment;

c. distribution of ownership and social classes;

d. economic order;

e. level of economic activities and their dynamics; and

f. type and size of relationship with the world economy.

Apart from this basic information, data is needed for problem analysis.

For urban and regional research,[2] the sphere of information covers the spatial, demographic, social, economic, administrative, and financial aspects, as well as settlement/city planning. A study will involve various disciplines and research objectives. The research objectives consist of the identification of the study area, analysis of structural elements, relational research, and developmental research. The whole concept is illustrated in table 12.1.

INFORMATION ACTUALLY USED AND ITS SOURCES

The ongoing research study on Bangkok Metropolitan Region[3] has been planned to make maximum use of existing data and the results of other recent or ongoing studies. This study aims to provide answers to the following four major questions:

a. Over five to fifteen years what will be the rate and composition of growth of BMR in terms of population and economic activity?

b. Within BMR where is the growth likely to occur? How will the new growth in population be distributed? How will employment in manufacturing, commerce, and services be distributed? How will development costs vary by location within BMR?

c. Given the rate and distribution of growth, what sectoral investments should have priority with particular reference to transportation, housing, water supply, and infrastructure?

d. How will it be possible to pay for the priority investments and for other urban services? How should institutions be designed to coordinate the investments and the provision of services?

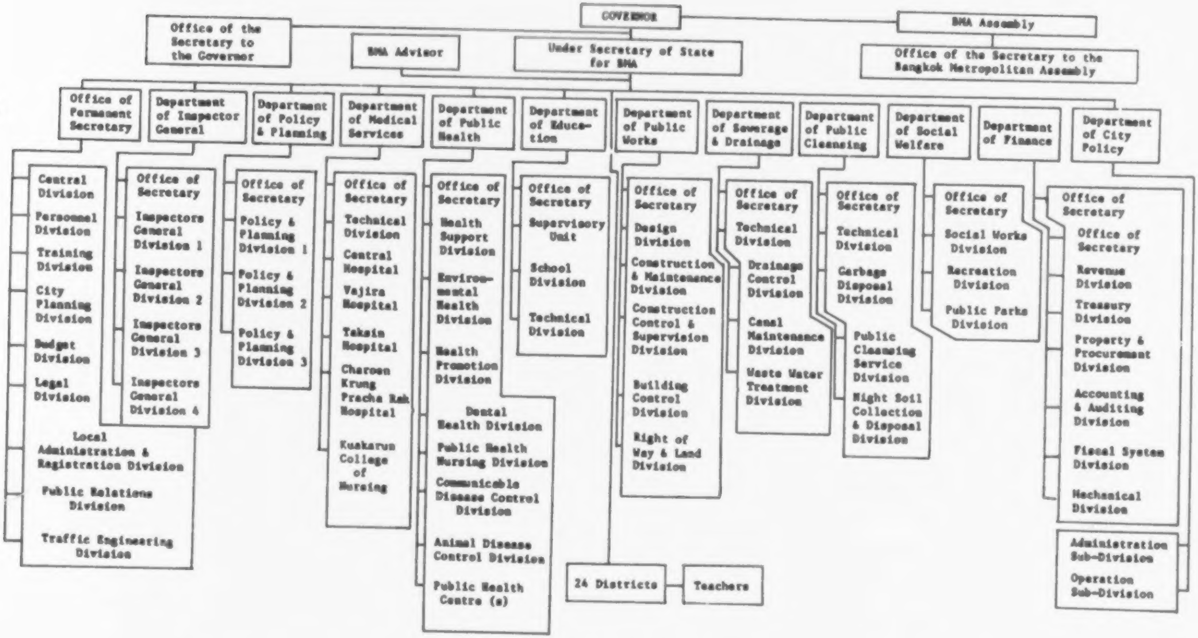
Existing information combined with data accumulated from previous BMA studies will be used in the study. The combined data can be classified into seven groups: Population, labour, income and expenditure, transport and communication, infrastructure and energy consumption, housing, and organization and administration. This grouping of information[4] can be further divided into 100 subgroups. Most of the data collected does not come from the BMA departments and offices (figure 49), but from the central administrative organizations and state enterprises. Only about 20 per cent of all this information is attributable to BMA. This reflects the degree of centralization of administration in Thailand, which has a great impact on the local governments' participation and on data organization and management as well (see Appendix A).

TABLE 12.1. THE CONCEPT OF EMPIRICAL URBAN AND REGIONAL RESEARCH

Research Objectives	ASPECTS					
Research Tasks	**Spatial**	**Demo-graphic**	**Social**	**Urban**	**Economic**	**Admin-istrative**
0. Identification of study area						
1. Structural research						
1.1. Existing structural elements						
1.1.1. Identification of objects						
1.1.2. Dimension						
1.1.3. Localisation						
1.1.4. Function						
1.2. Analysis of structural elements						
1.2.1. Qualitative order						
1.2.2. Quantitative order						
2. Relational research						
2.1. Functional relations						
2.2. Spatial correlations						
3. Developmental research						
3.1. Investigation of past development						
3.2. Relation between structure and process of interaction						
3.3. Projections and development models						
	1	2	3	4	5	6
Major Interested Disciplines	**Geography, Earth Science, Ecology, Landscape, Hydrology, Climatology**	**Demography, Biology, Medicine, Hygiene, Sociography**	**Sociology, Behavioural Research, Human Society and History, Social Psychology**	**Architecture, City Planning, Engineering, and Traffic Planning**	**Economics, Marketing and Consumption Research, Housing**	**Local Administration, Organisation, Finance, and Public Administration**

Source: O. Boustedt, "Grundriss der empirischen regionalforschung" (Hannover, 1975), p. 12, Teil 4, Regional statistik.

Figure 49. Bangkok Metropolitan Administration organization chart


GOVERNOR
BMA Assembly
Office of the Secretary to the Governor
BMA Advisor
Under Secretary of State for BMA
Office of the Secretary to the Bangkok Metropolitan Assembly
Office of Permanent Secretary
Department of Inspector General
Department of Policy & Planning
Department of Medical Services
Department of Public Health
Department of Education
Department of Public Works
Department of Sewerage & Drainage
Department of Public Cleansing
Department of Social Welfare
Department of Finance
Department of City Policy
Central Division
Personnel Division
Training Division
City Planning Division
Budget Division
Legal Division
Local Administration & Registration Division
Public Relations Division
Traffic Engineering Division
Office of Secretary
Inspectors General Division 1
Inspectors General Division 2
Inspectors General Division 3
Inspectors General Division 4
Office of Secretary
Policy & Planning Division 1
Policy & Planning Division 2
Policy & Planning Division 3
Office of Secretary
Technical Division
Central Hospital
Vajira Hospital
Taksin Hospital
Charoen Krung Pracha Rak Hospital
Kuakarun College of Nursing
Office of Secretary
Health Support Division
Environmental Health Division
Health Promotion Division
Dental Health Division
Public Health Nursing Division
Communicable Disease Control Division
Animal Disease Control Division
Public Health Centre (s)
Office of Secretary
Supervisory Unit
School Division
Technical Division
Office of Secretary
Design Division
Construction & Maintenance Division
Construction Control & Supervision Division
Building Control Division
Right of Way & Land Division
Office of Secretary
Technical Division
Drainage Control Division
Canal Maintenance Division
Waste Water Treatment Division
Office of Secretary
Technical Division
Garbage Disposal Division
Public Cleansing Service Division
Night Soil Collection & Disposal Division
Office of Secretary
Social Works Division
Recreation Division
Public Parks Division
Office of Secretary
Office of Secretary
Revenue Division
Treasury Division
Property & Procurement Division
Accounting & Auditing Division
Fiscal System Division
Mechanical Division
Administration Sub-Division
Operation Sub-Division
24 Districts
Teachers

Source: Dept. of Policy & Planning, 1 August 1983.

PROBLEMS OF DATA AVAILABILITY AND INFORMATION GAPS

Problems of Data Availability

Since the BMA departments and offices do not place much emphasis on the function of managing information, this causes problems of data availability and information gaps. This problem originates from the administrative system. First, there is overlapping of the functions of the BMA, of the central government administration, and of the state enterprises within the BMA area. Second, there is a difference in the administrative structures of BMA and those of the vicinity (the five provinces and their local centres).

Lack of cooperation in information management produces problems of data availability. The following problems can be cited:

a. Lack of comparability among the territories of jurisdiction of the various administrative agencies of provincial or local governments (especially BMA), central government agencies, and state enterprises.

b. Lack of precisely defined territories of administrative responsibility and authority (especially for the small subdivisions) and disparity in the sizes of these administrative areas.

c. Lack of data integration among various administrative agencies of differing organizational structures.

d. Lack of trained manpower within the administrative territory for effective data collection; as a result, there is lack of socioeconomic data on lower government levels (i.e., from the commune level, such as the Khwaeng of BMA; or from the block level, as in Tambon of the vicinity).

e. Lack of uniformity among data collection methods, especially consideration of the administrative boundaries.

f. Lack of appreciation of the value of producing and publishing spatial statistics.

Problem of Information Not Being Used Effectively

There is a problem of unreliable information because some data are not sufficiently checked, processed, and analysed. Some data are not complete and very often not timely. For example, the periods of data collection differ in time interval: ten years for the Population and Housing Census (1960, 1970, and 1980), fifteen years for the Agricultural Census (1963 and 1978), three years for the Industrial Census (for Bangkok, Nonthaburi, Pathum Thani, and Samut Prakan, 1978 and 1981), and fourteen years for the Trade, Business, and Services Census (1966 for the urban areas and 1980 for Bangkok, Nonthaburi, Pathum Thani, Samut Prakan, and the rest of the country). Nonetheless, the periods for the Five-Year National Economic and Social Development Plan and the BMA Development Plan coincide (1962, 1967, 1972, 1977, and 1982). The similarity in the time dimensions for data collection, however, is not a sufficient guarantee for the efficient preparation of the Five-Year Development Plan and causes problems in plan management.

Problem of Information Gaps

There are cases where there is too much information. Often the published data and information are not used in planning, because they are either superfluous or they are inappropriate to the task at hand.

Besides these problems, there are problems of quality of data, limited scope of social and environmental data, and inadequate research outputs.

METHODS OF DATA COLLECTION

The methods of data collection used for BMA and the vicinity are through administrative procedures. Data is collected by the districts and forwarded to the provinces. The twenty-four districts of BMA collect data on population, housing, new building permits, and income which are forwarded to the BMA headquarters monthly. Data on education, occupation, health, public infrastructure, social services, tourist facilities, and ongoing development projects are submitted annually from these districts to BMA.[5] Data are gathered by various BMA departments such as medical services, public health, education, public works, sewerage and drainage, public cleansing, social welfare, and finance.

Registration and census data are collected annually by central government agencies and research institutions.

Use of Techniques and Methods in Data Analysis

The techniques and methods presently used in data analysis are not very well developed. Some of the common statistical techniques are used, and basic analytical methods such as percentage and relative measurement are used. Computations are processed manually and results are presented in visual illustrative forms such as graphs, histograms, tables, and maps. For the BMA study, the Thai University Research Associates (TURA), the Institute of Social Study, Chulalongkorn University, and the Office of the National Economic and Social Development Board (NESDB) used macroeconomic model (Keynes), regional input-output model, and shift-share analysis.

ROLE OF PLANNING AGENCIES AND INTERDEPARTMENTAL INFORMATION LINKS

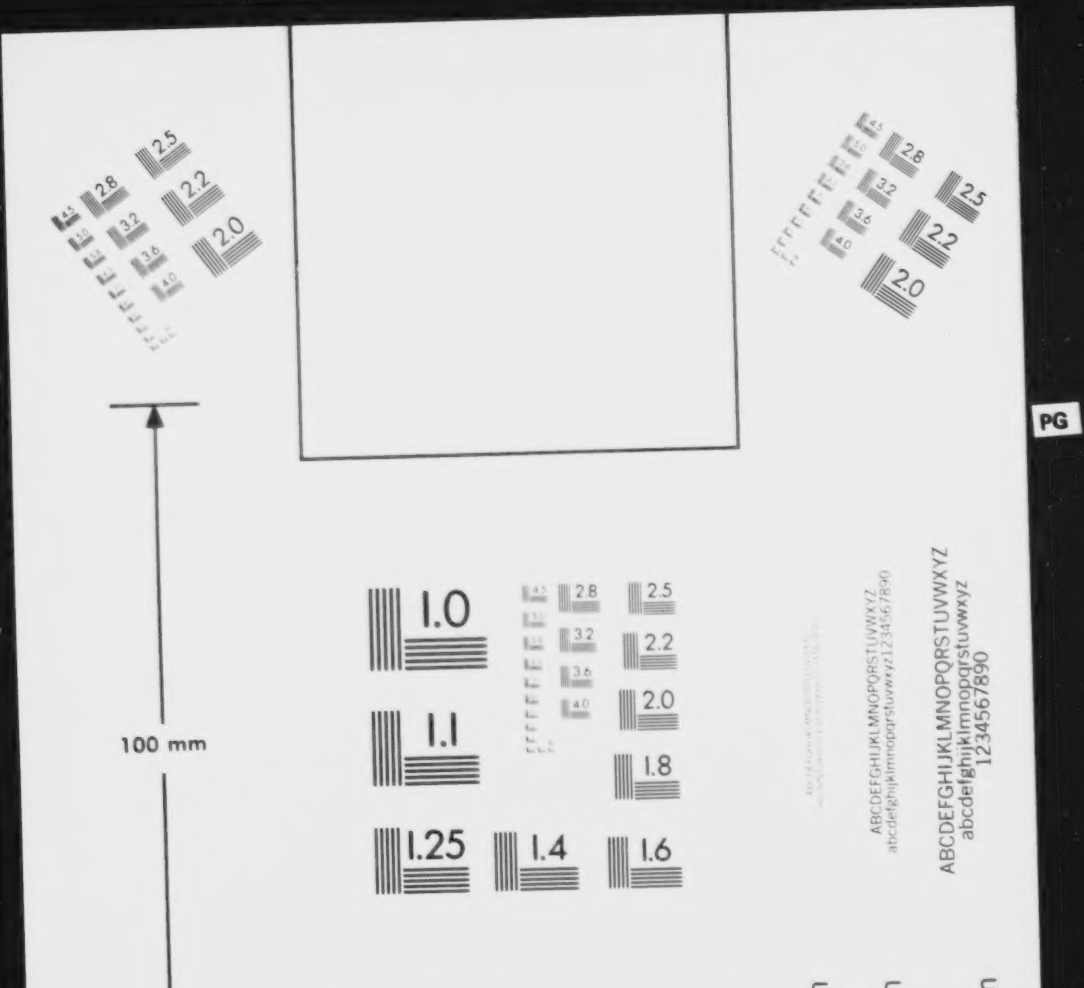
Role of Central Government Planning Agencies

The Regional Planning Division, Office of the NESDB, and the Department of Town and Country Planning (DTCP), Ministry of Interior, are responsible for preparing a regional policy plan and a physical structure plan for the development of BMR, respectively. The DTCP is also responsible for local development planning for the municipalities outside BMA. Both agencies are the main collectors, producers, and users of BMA's information at the regional level.

Role of BMA Planning Agencies

Department of Policy and Planning (DPP)

The DPP, with occasional help from the Advisory Board of Policy and Planning, supplies information and recommendations to the Governor and the BMA Assembly, and integrates the planned projects. About 60 per cent of the information collected by the DPP is used in its plan making and disseminated to other BMA departments such as the Departments of Health, Public Cleansing, and Education. Other data users include the National Research Council, the National Statistical Office, the Department of Policy and Planning under the Ministry of Interior, and the Office of the NESDB. The number of data users and frequency of use are not very large among the various agencies. This reflects, not only the underutilization of the available information, but also the inappropriateness and inadequacy of such information for the purposes of the potential users.


PG
A5
100 mm
1.0
1.1
1.25
1.4
1.6
1.8
2.0
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2.5
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1.0 mm
1.5 mm
2.0 mm
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz1234567890
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

City Planning Division (CPD)

Although the CPD is now under the Office of the Permanent Secretary, its function is similar to that of the DPP. However, it concentrates only in area development planning at the subregional and block level. Its function necessitates the collection of information from other departments, especially the DPP.

Because of the common requirements for information as noted above, it is essential that a centre for data collecting, processing, and analysis, and for plan management be established for the BMR.

DATA PROCESSING AND ANALYSIS

Data processing and analysis are usually done manually with the use of conventional office machines. The Land Development Tax Project and some ad hoc special projects, however, are now utilizing computer systems. Because of the deficiencies of the manual system, the DPP plans to use computers for such administrative tasks as personnel data management (with more than 25,000 BMA employees) and the maintenance of records on automobiles, machinery, and equipment.

MONITORING AND EVALUATION SYSTEMS

In general, responsibility for implementation of approved plans is placed upon the district offices (Khet) where the work is organized by committees. The Department of Inspector General is responsible for evaluation of such implementation. A report on the monitoring and evaluation of construction projects is rendered every two weeks on the district level. The evaluations in other major areas, such as administration, registration, public cleansing, public health, education, city police, revenue, and finance are undertaken annually. Survey questionnaires are used in collecting the data on these types of projects. The significant features of the evaluation system are the law, order, and logic of four aspects (i.e., site, products, accounting and auditing, and behaviour and ability of the staff). Upon completion of each evaluation cycle, results are presented in report form by the Director of the Department of Inspector General to the Secretary of State for BMA.

ORGANIZATION AND MANAGEMENT OF INFORMATION SYSTEMS

The DPP recently established a small information centre for the purpose of gathering information from central statistical agencies such as the National Statistical Office; local statistical units such as district offices and other local service centres; information gathering sections of specific projects such as the Flood Control Project and the Improvement of Traffic Regulation Project in inner BMA; national and local research institutes, universities, and libraries; the National Institute of Development Administration; and other national, regional, and local administrative units. Because such information collected is broad in scope, there is a need to improve the accessibility to and refine the quality of this information so that it may be a meaningful input to the management process.

The BMA's information system is not well organized, and some form of centralized coordination of information should be designed. In that regard it is proposed that the Policy and Planning Division 1 under the DPP (which now consists of the Basic Data Collection Section, the Planning Section, and the Computer System Section) should be reorganized into a Data Processing Services Department. The new Data Processing Services Department would then be responsible for computer operations, applications, programming, and data entry functions, as well as for the ancillary operations of printing and microfilming. The Policy and Planning Division 2 (which now consists of the Planning of Implementation Section, the Planning Management Section, and the Monitoring and Evaluation Section) should be reorganized into a Management Systems Development Department, which should then be responsible for systems analysis and operations research. The proposed restructuring of these departments is based on a concept of urban information management currently being used by the city of Calgary in Canada.6/

Two major functions could then be more effectively supported by the consolidated information system: operational control and management planning. The operational control function refers to the carrying out of specific tasks in functional areas, effectively and efficiently. The information requirements are usually well-defined, detailed, frequent, and directed towards specific applications. The management planning function, on the other hand, refers to the establishment and attainment of the organization's objectives through the allocation of human and material resources.

This concept should be applied to the BMA's planning structure so as to improve the organization and management of information systems.

NOTES

1/ K. G. Thalheim, *Aufriss einer volkswirtshaftlichen strukturlehre* (Zeitschrift für die gesamte Staatswissenshaft, 1939), p. 464.

2/ O. Boustedt, "Grundriss der empirischen regionalforschung" (Hannover, 1975), pp. 10-2, teil 4, Regional statistik.

3/ Research jointly sponsored by the National Economic and Social Development Board and World Bank in preparation for the Sixth Five-Year National Development Plan.

4/ This information does not include aerial photographs, topographic maps, or other thematic maps.

5/ The district offices are the implementing agencies, while BMA is concerned with policymaking and planning.

6/ Calgary, Canada, "Urban Information Management: The Calgary Approach" (Calgary: Management Systems Development Dept., 1975), pp. 6-7.

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APPENDIX A. INFORMATION ACTUALLY USED IN BANGKOK METROPOLITAN AREA AND BANGKOK METROPOLITAN REGION STUDY AND PLANNING

Area	Province	District	Commune	Urban Area Outside BMA	
Information	(Changwat)	(Amphoe)	(Tambon)	Municipality (Tesaban)	Sanitation District (Sukha Phiban)
	(1)	(2)	(3)	(4)	(5)
BMR	6	50	437	8	37
BMA	1	24	150	-	-
Vicinity Area	5	26	287	8	37
1. Population					
Population by sex 1/2/11/	X	X	X	X	X
Household 1/ by type 2/	X	X	-	X	X
No. of births 1/12/	X	X	X	X	-
No. of deaths 1/12/	X	X	X	X	-
Five-year age group 2/	X	X	-	X	X
No. of immigrants 1/11/	X	X	X	X	-
No. of emigrants 1/11/	X	X	X	X	-
Migration of pop. > 5 years 2/	X	-	-	-	-
Migrants by reasons for moving 2/	X	-	-	-	-
Pop. by Changwat of birth 2/	X	-	-	-	-
Pop. > 13 years by marital status 2/	X	-	-	X	-
Married woman > 15 years by No. of children born alive 2/	X	-	-	-	-
Pop. by religion 2/	X	-	-	X	-
Pop. by literacy 2/	X	-	-	-	-
Pop. 6-29 years by school attendance and grade 2/	X	-	-	X	-
Pop. by years of school completed 2/	X	-	-	X	-
Agriculture household 2/13/	X	X	-	X	X
Farm population 3/13/	X	-	-	-	-
No. of holdings by legal status, by size 3/	X	-	-	-	-
No. of holdings by tenure 3/	X	X	-	-	-

(APPENDIX A continued)

	(1)	(2)	(3)	(4)	(5)
2. Labour					
Pop. > 11 years by type of economic activity 2/	X	-	-	X	-
Employment by major sectors 2/	X	-	-	X	-
Employment status 2/	X	-	-	X	-
Seasonal unemployment 2/	X	-	-	-	-
Employment by business trade and services 4/	X	-	-	-	-
No. of employees and amount paid by kind of goods-services 4/	X	-	-	-	-
Employment in industrial establishment by work status 5/	X	-	-	-	-
No. of industrial employees by sex and amount paid 5/	X	-	-	-	-
No. of industrial employees by established manufactures 29/	X	X	X	X	-
Firm size and size-related characteristics for manufacturing 7/13/	X	X	X	X	-
3. Income and Expenditure					
Gross Domestic Product (GDP) by major sectors 8/	X	-	-	-	-
GPP per capita 8/	X	-	-	-	-
Sources of revenue and receipts* 9/14/	X	-	-	X	X
Expenditures by type 9/14/	X	-	-	X	X
Government spending 9/15/27/	X	-	-	-	-
Registered capital of commercial establishment 28/	X	X	-	-	-
Registered capital of industrial establishment 7/	X	X	-	-	-
Registered capital of firms granted promotion certificates 30/	X	-	-	-	-
No. of branches of commercial banks 24/31/	X	X	-	X	X
Deposit of commercial banks by type 31/	X	X	-	X	X
Credit of commercial banks by type 31/	X	X	-	X	X

Note: * For budget purposes, the revenue and expenditure of BMA are divided into 24 districts.

(APPENDIX A continued)

	(1)	(2)	(3)	(4)	(5)
No. of tourists and tourists' expenditure by major groups 32/	X	-	-	-	-
Average income and expenditure of household by income groups 6/	X	-	-	-	-
Consumer price index 6/	X	-	-	-	-
Wholesale price index 6/	X	-	-	-	-
4. Transport and Communications					
No. of persons working in transport, storage and communication 2/	X	-	-	X	-
GPP of transportation and communication 2/	X	-	-	-	-
No. of registered vehicles 33/	X	-	-	-	-
Traffic accident 33/	X	-	-	-	-
Traffic flow and volume 34/	X	-	-	-	-
No. of gas stations 16/42/	X	X	-	-	-
Length and surface area of street 17/34/	X	-	-	X	X
No. of main and sub-railway stations 35/	X	X	-	X	X
Length of track and traffic density by type 35/	X	X	-	X	X
Freight and passenger carried at railway station 35/	X	-	-	-	-
No. of registered vessels 36/	X	-	-	-	-
In- and outflow of transport ships 37/	X	-	-	-	-
Density of air traffic by type of airplane 38/	X	-	-	-	-
No. of post office, letter and telegraph 39/	X	-	-	-	-
No. of T.V. and radio stations 39/	X	-	-	-	-
No. of telephone lines capacity and waiting list 40/	X	-	-	-	-
No. of telephone calls 40/	X	-	-	-	-
No. of local newspapers 39/	X	-	-	-	-

(APPENDIX A continued)

	(1)	(2)	(3)	(4)	(5)
5. Infrastructure					
No. of electric consumers 41/	X	-	-	X	-
Electric consumption by type 41/	X	-	-	-	-
Petroleum consumption by type 42/	X	-	-	X	-
Liquid Petroleum Gas (LPG) 42/	X	-	-	-	-
No. of users of watersupply 43/	X	-	-	-	-
Water supply productivity and water produced 43/	X	-	-	-	-
Water resources management and flood control* 44/	X	-	-	-	-
Drainage and wastewater treatment 18/	X	-	-	-	-
Garbage disposal 19/	X	-	-	X	-
No. of hospitals, beds, physicians, nurses, and other personnel 20/24/45/	X	X	-	-	-
No. of schools, classrooms, teachers, and students by type and level 21/24/46/	X	X	-	-	-
No. of universities and colleges by type 47/	X	-	-	-	-
No. of students graduated during the year by type of education 47/	X	-	-	-	-
No. of police stations, fire stations, and policemen 22/33/	X	X	-	-	-
Community services, no. of marketplaces, cinemas, and temples 13/15/24/	X	X	-	-	-
Public open spaces, parks, playgrounds, and sport fields 23/	X	-	-	-	-
6. Housing					
Private households by type of living quarters and business used 2/	X	X	-	X	X
Private households by type of construction materials and business used 2/	X	X	-	X	X
Private households by tenure of living quarters and business used 2/	X	X	-	X	X
Private households by landownership and type of living quarters 2/	X	-	-	-	-
Monthly rent and advance payment by type of living quarters 2/	X	-	-	-	-

Note: Water resources management in the Lower Chao Phyra River Basin System.

(APPENDIX A continued)

	(1)	(2)	(3)	(4)	(5)
No. of bedrooms and other rooms used for sleeping by size of households 2/	X	-	-	-	-
Private households by source of drinking water, water supply, and lighting 2/	X	-	-	-	-
Private households by type of bathroom and toilet facility 2/	X	-	-	-	-
Private households by type of kitchen and cooking fuel 2/	X	-	-	-	-
Private households by type of durable household appliance 2/	X	-	-	-	-
No. of public housing units by type 13/48/	X	X	-	-	-
Public housing units by size and monthly rent 13/48/	X	X	-	-	-
Private housing projects by size and unit cost 13/48/	X	X	-	-	-
Residential buildings with permission from Dept. of Building Control by size 25/31/	X	X	-	-	-
Distribution of slums and squatters by size 13/48/	X	X	-	-	-

7. Organization and Administration

	(1)	(2)	(3)	(4)	(5)
Development of Bangkok Metropolitan Administration and Municipalities 1/26/49/	X	-	-	X	-
Administrative structure of provincial and local government institutions 1/26/49/	X	X	X	X	X
Internal structure of institutions 1/26/49/	X	X	X	X	X
Functional departments 26/49/	X	-	-	-	-
Information on leadership objectives and resources 26/49/	X	X	-	X	X
Coordination with public services 26/49/	X	X	X	X	X

SOURCES

1/ Registration Division, Dept. of Local Administration, Ministry of Interior;

2/ Population and Housing Census, National Statistical Office, Office of the Prime Minister;

3/ Agricultural Census, National Statistical Office, Office of the Prime Minister;

4/ Census of Business Trade and Services, National Statistical Office, Office of the Prime Minister;

5/ Industrial Census, National Statistical Office, Office of the Prime Minister;

6/ Report on Socio-Economic Survey, National Statistical Office, Office of the Prime Minister, and Dept. of Business Economics, Ministry of Commerce;

7/ Registration Data for New Establishments, Expansions and Renewals of Licenses, Dept. of Industrial Works, Ministry of Industry;

8/ Gross Regional and Provincial Product, National Income Accounts Division, Office of the National Economic and Social Development Board;

9/ Budget Bureau, Comptroller-General's Dept., and Bank of Thailand;

10/ Bangkok Metropolitan Administration;

11/ Local Administration Registration Division, Office of Permanent Secretary;

12/ Planning Section, Office of the Secretary, Dept. of Public Health;

13/ City Planning Division, Office of Permanent Secretary;

14/ Accounting and Auditing Division, Dept. of Finance;

15/ Revenue Division, Dept. of Finance;

16/ Environmental Health Division, Dept. of Public Health;

17/ Construction and Maintenance Division, Dept. of Public Works;

18/ Drainage Control and Waste Water Treatment Division, Dept. of Sewerage and Drainage;

19/ Garbage Disposal Division, Dept. of Public Cleansing;

20/ Office of Secretary, Dept. of Medical Services;

21/ School Division, Dept. of Education;

22/ Administration Sub-Division, Dept. of City Police;

23/ Recreation and Public Parks Division, Dept. of Social Welfare;

24/ Report from twenty-four districts;

25/ Building Control Division, Dept. of Public Works;

26/ Policy and Planning Division 3, Dept. of Policy and Planning;

27/ *Urbanization in Bangkok Central Region* (Bangkok: Thai University Research Associates, 1975);

28/ Dept. of Commercial Registration, Ministry of Commerce;

29/ Dept. of Labour, Ministry of Interior;

30/ Board of Investment, Office of the Prime Minister;

31/ Bank of Thailand, Ministry of Finance;

32/ Tourist Organization of Thailand, Office of the Prime Minister;

33/ Licenses Division, Police Dept., Ministry of Interior;

34/ Dept. of Highways, Ministry of Communications;

35/ State Railway of Thailand, Ministry of Communications;

36/ Dept. of Harbour and Marine Transport, Ministry of Communications;

37/ Port Authority of Thailand, Ministry of Communications, and Dept. of Customs, Ministry of Finance;

38/ Airports Authority of Thailand, Ministry of Communications;

39/ Communication Authority of Thailand, Ministry of Communications;

40/ Telephone Organization of Thailand, Ministry of Communications;

41/ Metropolitan Electricity Authority and Provincial Electricity Authority, Ministry of Interior;

42/ Petroleum Authority of Thailand, Ministry of Industry;

43/ Metropolitan Waterworks Authority and Provincial Waterworks Authority, Ministry of Interior;

44/ Dept. of Irrigation, Ministry of Agriculture;

45/ Dept. of Health, Ministry of Public Health;

46/ Depts. of Elementary and Adult Education, Secondary Education, Vocational Education, Teacher Training, Physical Education, and Educational Techniques, Ministry of Education;

47/ Educational Reports, Institution of Higher Education, Office of University Affairs;

48/ National Housing Authority, Ministry of Interior; and

49/ Dept. of Policy and Planning, Ministry of Interior.

SYNTHESIS

CRITICAL PERSPECTIVES ON INFORMATION SYSTEMS FOR URBAN AND REGIONAL PLANNING

J. S. Edralin

INTRODUCTION

What is the state of the art of information systems for urban and regional planning in the developing countries? What are the constraints on the introduction and implementation of information systems for urban and regional planning in the developing countries? A research project focusing mainly on four Asian metropolitan regions, particularly Bangkok, Kelang Valley, Manila, and Seoul, was carried out by the United Nations Centre for Regional Development in 1983 to discuss these questions and to see how the recent experience of these four Asian metropolitan regions with information systems could contribute to answering them. The following synthesis, based on the concept papers and country case studies prepared for or contributed to the research project, focuses on some of the conceptual, theoretical, and empirical issues which were explored and discussed in the papers and studies. The concept papers have many valuable lessons to offer in terms of the definition, design, implementation, applications, and evaluation of information systems for urban and regional planning in the developing countries. The country case studies highlight problems of identifying information requirements, data availability, data collection, data processing, and data analysis, and monitoring and evaluation, and suggest the need for well-designed and organized information systems for the effective formulation and implementation of urban and regional plans.

CONCEPTUAL AND THEORETICAL PERSPECTIVES

Concept of Information Systems for Urban and Regional Planning

The concept of information systems utilizing modern technology is very recent and still evolving. Although the concept is broadly understood to mean the process by which information is identified, collected, organized, processed, analysed, retrieved, and disseminated for decision making and planning, it has not been given a widely accepted definition. It is probably easier to define it in terms of its use and function in public administration and planning.

In the context of public administration, Itoko Suzuki presents four typologies of information systems, as follows:

(a) Information systems supporting internal management functions of public sector organizations (e.g., personnel, financial, budgeting, treasury management, and day-to-day management of services);

(b) Information systems supporting regulatory and specific functions in public administration (e.g., registers for residents, enterprises and establishments, buildings, spatial or geographical units, and motor vehicles; legal, fiscal, social security and employment, police and security, health, education, and other sectoral information systems);

(c) Information systems supporting public service management functions (e.g., service-oriented information systems such as public transport, financial institutions, postal services, telecommunications, public utilities, and radio and television information systems); and

(d) Information systems supporting planning and policymaking (e.g., scientific and technological information systems, juridical information systems, and supply-oriented socioeconomic information systems, such as statistical, geographical, and chronological or time series information systems).

In the context of urban and regional planning, Christian P. Avérous identifies four types of information systems:

(a) Quantitative information systems, which include estimated, measured, or scaled data;

(b) Synthetic information systems, which include data of a certain degree of aggregation over time, geographic areas, and population groups);

(c) Systemic information systems, which organize information according to a conceptual, descriptive, and informative model; and

(d) Functional information systems, which serve a clearly specified function in the formulation, implementation, and evaluation of policies and plans.

Avérous further identifies the functions of such information systems. These include:

(a) Descriptive function (i.e., to monitor a state, or to describe a situation through urban profiles, public opinion surveys, and national and international programmes integrating urban sociodemographic, economic, and environmental statistics);

(b) Cognitive function (i.e., to understand urban and regional phenomena through the use of statistical methods and models which analyse interdependent variables); and

(c) Normative function (i.e., to act at project, programme, or planning levels by: (i) helping to reduce the costs of implementing routine managerial tasks, such as the management of public administration personnel, the local tax system, and local government budgets; the maintenance of population records, voters' lists, and registers of births, marriages, and deaths; payment of social benefits; and billing for public utilities; (ii) monitoring the impact of decisions already taken, so that corrective decisions can be taken in response to the deviation between the real and the target situation, e.g., urban air pollution alert systems, regional flood alert systems, and fund allocation mechanisms among cities or regions; or (iii) evaluating the impacts of projects, programmes, or plans with respect to assigned objectives, e.g., cost-benefit analysis and multiple criteria analysis.

Three functions that define technologically-supported urban transportation planning information systems are outlined by Marvin Manheim and Joseph L. Schofer:

(a) Information acquisition (i.e., the collection, processing, and management of large datasets, leading to: (i) more complex models of large and detailed networks; (ii) an expanded understanding of the behavioural phenomena underlying urban travel; and (iii) the development of theory, models, and procedures which increase the sophistication of planning and analysis).

(b) Information maintenance (i.e., the periodic updating and revision of data through sophisticated, small-scale sampling techniques, geocoding systems, and the use of remote sensing).

(c) Information services delivery (i.e., the provision of raw and processed data to respond to users' need, through varied and flexible delivery products, formats, media, and timing).

Designing Information Systems for Urban and Regional Planning

A major issue in designing information systems for urban and regional planning is how to organize, administer, and manage the systems. Designing information systems requires making a decision about the objectives, purpose, scope, and basic design of the systems. It also requires evaluating the application or specific uses to be made of the systems, the technical alternatives for accomplishing the systems, and the institutional and organizational arrangements for the systems.

The first thing that should be kept in mind in designing information systems is that user involvement or participation is very vital for the formulation of an effective design strategy. User involvement increases user acceptance of the information systems. Ian Masser maintains that user involvement not only reduces the possibility of later criticism, but is essential if the systems are to operate effectively, because much of the information that is required will have to be supplied by the users themselves. Hence, Masser points out that the first stage in the development of information systems is to determine the nature of user requirements by consulting the staff who are likely to be involved. This implies that there is a need for mutual consultation or dialogue between users and systems designers. Peter Nijkamp is of the opinion that permanent user-surveyor dialogue guarantees a meaningful coordination of the various tasks in a planning process.

Another thing that should be kept in mind is that the design of information systems should be guided by the specification of the benefits which can be obtained from their use. Averous states that systems design for urban and regional planning involves the consideration of three variables: people, local government, and national government. The tangible benefits of introducing information technology derive from three basic areas:

(a) Improving the delivery of services to users;

(b) Providing an opportunity for better information of the public; and

(c) Providing an opportunity for more informal participation of the public in decision making processes.

The key issue is to ensure that the right facilities are provided which can maximize the benefits of the technology for the people. Careful attention needs to be paid to the requirements of information systems and privacy protection.

Four applications where local government can derive benefits from the use of information systems are those dealing with repetitive administrative tasks, local managerial tasks (e.g., budgeting), short-term decision making and planning (municipal information systems), and medium- and long-term planning (models and data banks for planning).

In the systems design stage of local government information systems, methodologies should be developed for meeting the following needs pointed out by Avérous:

(a) Improving the effects of information technology on the individual tasks of operating personnel, management staff, and elected decision makers.

(b) Training the different categories of personnel (e.g., operating staff, heads of data processing departments, administrative personnel, and decision makers).

(c) Improving the effects of information systems on local government organization.

(d) Improving services provided by local government.

(e) Analysing the costs and benefits of information systems in local government.

The importance of the national government role in stimulating and coordinating the development of information technology and information systems for urban and regional planning has been emphasized by Avérous. This involves provision of technical and financial support, commitment of national government resources for purchase of computer systems and software, training of personnel, legislative and regulatory action, and the harmonization of hardware, software, data, and data communication systems.

In similar vein is the remark of Suzuki that local or central government can play a crucial role in formulating policies on information systems, supporting legislation, programmes, and regulations, and establishing institutions which would advise and/or support information systems development.

In the context of designing statistics for urban and regional planning in the developing countries, Nijkamp suggests that particular attention must be given to: (a) the need for a unifying conceptual and operational framework for information to resolve institutional and integration problems; (b) the problem of manageability and simplicity of data banks; and (c) the need for integrated, coherent, and accessible information systems.

Another suggestion made by the United Nations Statistical Office, which is reported in Luciano Minerbi's paper, is that a programme for the organization of environmental statistics should utilize three tasks which need to be integrated and phased: (a) development of a framework, scope, and guidelines for the organization of environmental information; (b) staged development of an environmental information system both vertically between the central and local level and horizontally across ministerial lines at various geographical or functional scales; and (d) development of scientifically tested procedures to monitor environmental problems and processes.

Implementation of Information Systems for Urban and Regional Planning

Implementation is concerned with the inventory of data needs and data sources and the creation of an information system. Key questions to be addressed are: (a) What data are required for urban and regional planning? What data about the situation at the urban and regional level should be collected? Who will use the data? What are the sources of data? Are the data available and accessible? What are the channels through which data are obtained and transmitted? How should data be collected? How should data be presented and disseminated? (b) What type of information systems should be established? What are the functions and tasks of the information system? What methods, devices, and programmes should be used for data input, storage, processing, analysis, and retrieval? How will the system be organized? Who will be responsible for organizing, maintaining, and managing the information system?

Data inventory

Planning is a periodic process, which includes plan revision steps. Whether data exist or not, planners will continue to make and revise plans. The important thing is how to improve the quality and increase the efficiency and effectiveness of urban and regional planning through systematic collection and analysis of data.

Information systems can aid this iterative process but the information supplied should be timely, relevant, and useful to urban and regional planning. Suitable criteria for judging the quality of information for urban and regional planning, as suggested by Nijkamp, could include: availability, actuality, accessibility, consistency, completeness, relevance, pluriformity, comparability, flexibility, measurability, comprehensiveness, effectiveness, versatility, and validity of information. In addition, some specific regional or multiregional elements of data have been stressed by Nijkamp as being the most important to be considered in implementing information systems. These include:

(a) Data integration (i.e., the information system should ensure the comparability of data between regions and the coordination of planning activities in different agencies);

(b) Data on interregional interaction (i.e., the information system should provide data on interregional commodity flows, migration flows, and capital flows);

(c) Data on regional bottlenecks (i.e., the information system should provide data on monetary flows between regions);

(d) Data on multiregional decision making (i.e., the information system should provide data on the regional economy and on flows of income and profit between regions); and

(e) Data standardization and sensitivity (i.e., the information system should ensure comparability of data in terms of space, time, or descriptive detail).

It is not easy to satisfy all of the requirements at once. According to Nijkamp, there has to be a compromise between various conflicting criteria so that information systems can fulfill the information needs for urban and regional planning.

The generation of a data base for urban and regional planning involves combining data from existing data sources (e.g., censuses, administrative records, data from the sectoral departments, maps, remote sensing or aerial photographs, surveys undertaken by universities and research organizations, and literature surveys), statistical analysis, field surveys to identify problems and assess current situations, participant observation, questionnaire surveys, informal interviews, and other subjective approaches to data collection. All the data sources must be compared through a cost-benefit analysis and evaluated in terms of their applicability or utility to urban and regional planning. Nijkamp is of the opinion that there should be a trade-off between the costs of producing relevant information from appropriate data and the benefits of using this information in actual planning procedures or policy choices.

With respect to data collection for monitoring and evaluation activities, Masser offers the following guidelines:

(a) The scope of data collection activities depends on the extent to which the goals and objectives of the exercise can be expressed in operational terms.

(b) Effective monitoring and evaluation at the strategic level depend heavily on the extent to which secondary sources can be utilized.

(c) Questions of consistency and comparability are likely to occupy a great deal of the effort that is devoted to the collection of statistical data, because of the diversity of sources from which this material is obtained.

(d) Consultations with other parts of the same agency, other agencies, interest groups, and the public play a central role in intelligence gathering activities.

(e) Large-scale questionnaire surveys should be avoided as a means of data collection for monitoring and evaluation.

Thus, the task of data collection for urban and regional planning is not an easy one. A common practice of collecting data for multipurposes forfeits the advantage of data selection and acquisition for specialized purposes. Perhaps the single greatest challenge to urban and regional planning information systems is to manipulate, disaggregate, or adjust the data to support the planning and monitoring and evaluation processes. Information systems should try to meet this challenge by means of geographic referencing of regional information. Geographic references may indicate administrative areas or political jurisdictions, location of industrial complexes, markets, raw materials, energy sources, transportation or communication networks, and nodal regions or fields of influence around urban or government centres. Some guidance is given by Nijkamp and Manheim and Schofer on geographic or spatial referencing schemes. Geographic referencing involves referencing data to coordinate point locations or to grid areas. Selection of the appropriate referencing system depends on how detailed the geographic referencing must be, or on how specific the data should be. It also depends on the equipment for map processing, the size of the area, and the existing practices of the planning agency.

Establishing an information system for urban and regional planning

Data for urban and regional planning require management. There has to be an information system so that data can be properly stored, located, retrieved, updated, and disseminated. The choice is between manual and computer-based data handling and processing systems. Both systems have their own strengths and weaknesses. However, computer-based information systems facilitate quantitative analysis, as well as the use of quantitative planning techniques and models. They can handle speedily and accurately large volumes of data, and thus give timely and accurate data.

In making a decision on the use of computer-based information systems, one should consider the policy, organizational and human resource, and technical factors which can assist in this process. Some of the policy aspects which can assist the introduction of computer-based information systems for urban and regional planning are:

(a) Appropriate national policies for adopting and utilizing information technology. The need for a national policy is shown by Suzuki to be important in the implementation of information systems. A central focal institution or central guidance agency has an important role to play in the formulation and implementation of policies on information systems. The following policies regarding information systems may be required: (i) policies for development and maintenance of information systems; (ii) policies for coordinated development and transfer of software and applications; (iii) policies for guiding data collection, processing, analysis, retrieval, and dissemination; (iv) policies on employment and working conditions in information systems organizations; and (v) policies on access to data, and data privacy or protection.

(b) Centralization or decentralization of information systems. Several criteria have to be met before information systems can be centralized or decentralized. A centralized information system requires the use of central computing facilities for providing computer services to urban and regional planners. It also requires centralized provision of systems development and programming skills. The adoption of centralized information systems will encourage the adoption of information technology and standardize its use in urban and regional planning. On the other hand, a decentralized information system requires the adoption of distributed data processing with communication by networks.

David Moskovitz and David Mammen maintain that the adoption of decentralized information systems will give users an opportunity to make decisions about the procurement, development, and use of information technology, as well as to share and exchange information. Decentralized information systems will also allow for diversity in experimentation and innovation in the use of information technology, but may result in unnecessary duplication of information. According to Moskovitz and Mammen, there is evidence in state and local governments in the United States that lack of quality control, technical competence, and system compatibility in decentralized information systems leads to difficulties. Much of this could be avoided if attention is paid to system integration. In the particular context of urban information systems, a satellite design is recommended by Nijkamp as a useful device for achieving consistency among the various policy fields such as the housing market, the labour market, and medical facilities.

(c) Access to information. The lack of access to specialized information is a problem in many countries. Most often, the data are scattered over many offices which use their own spatial administrative definitions, according to Nijkamp. With the rapidly evolving information technology, attempts should be made to provide more up-to-date information on data sources, data bases, data availability, dissemination policies, as well as on means of dissemination. The definition of the word "official" places constraints on the availability of information not specifically cleared for dissemination by the government. In Socialist countries, "official" information is presumed to be confidential. In other countries, information relating to financial, commercial, and trade topics where speculation could take place is considered confidential. Nijkamp maintains that information on financial and knowledge flows is difficult to collect, compared to information on the flow of people and commodities. In some countries, data on geological or natural resources from aerial surveys and remote sensing are considered confidential. In other countries, politically sensitive information is used with caution or avoided.

The growth of transborder data flows permits access to information across country borders. It also permits the international use of data networks and software. However, such problems as the differences between the countries' legal systems and laws on

> privacy protection, liability and security of data, lack of copyright laws, authentication of information, and protection of software, must be solved because otherwise transborder data flows will create problems for data users.
>
> The right of access to administrative information (through open administration policy and Freedom of Information Acts) is increasingly recognized by many countries. Opening the information system out to the public can be very useful if a meaningful popular participation in planning and administration is desired. The application of the open policy of administration may, however, be criticized for overexposure of information. There is a need to protect citizens from the misuse of data bases and to guarantee the privacy of individuals. Moreover, there is a need to distinguish between public documents authorized by law, private documents, and those which present no threat to privacy.

The implementation of information systems requires extensive commitment of organizational, financial, and human resources, as well as organizational preparation. The type of information system and technology to be adopted depends on what is organizationally and financially feasible.

Planning for implementation of information systems should include: (a) a time schedule; (b) a budget sufficient for accomplishing the information system project; (c) the identification of personnel needs, including present and future staffing levels and training requirements (as stressed by Avérous, Suzuki, and Moskovitz and Mammen); (d) facilities planning and the preparation of site; (e) preventive maintenance planning; (f) establishing priorities for implementation of application software packages; and (g) the development of software packages to be implemented before the installation of hardware.

It is important in every planning organization moving towards a computer-based information system to have one part of the organization responsible for the development, maintenance, and management of the information system. This will ensure that a clear and consistent strategy is pursued, direction is maintained, and priorities are clearly established for information systems development.

The implementation of computer-based information systems will require new technical skills and implementation techniques. A team of high calibre information specialists and managers should be recruited and maintained to ensure systems continuity. This has been emphasized by Suzuki and Moskovitz and Mammen. This may, however, prove difficult, because salaries in the private sector are relatively higher than in the public sector and there is a high demand for good quality specialists in information handling, processing, and management. Therefore, careful attention needs to be given to the requirements of the job and motivation of the staff. A consistent effort should be placed into educating and training the staff and other users in the use of the information system, specifically in any available nonprocedural languages and the use of the data base. Regular seminars and workshops on major topics, such as the principles of managing computer-based information systems, data base, and new technological developments should be held for middle management, planners and researchers, and other technical personnel.

There is a wide range of choice in information technology (e.g., Manheim and Schofer cite micro- and minicomputers, miniaturized data collection terminals, modern mass storage devices, remote sensing methods, and geocoding systems). An important advice is the need to invest in simple, easy to use, state of the art technology related to clearly defined urban and regional planning needs. For example, Manheim and Schofer believe that it is feasible to engage in state of the art urban transportation planning without large-scale, resource-intensive data collection efforts, through the effective use of geocoding systems.

In making decisions about what systems to buy, one should consider the following features of computer systems;

(a) the technical and performance capabilities and expansion possibilities of the computer system. (The computer system should make possible the combination and joint processing of text, numerical, and graphic information.)

(b) the differences in design between the computer systems. (The use of the computer system should have advantages over other systems.)

(c) the potential cost savings which could be realized by the computer system. (The cost of using the computer system should be reasonable within the context of total organizational costs.)

(d) the potential problems associated with the computer system.

(e) the extent of transferability of the computer system to other systems.

(f) the compatibility of the computer system with the country's technological base.

Applications of Information Systems

The range of applications of computer-based information systems is enormous, with accounting, personnel, budgeting and capital programming, census, person registers, and cadastral surveys being the most common, though ad hoc applications are also numerous. For example, the City of Baltimore, according to Larry Reich, uses a computer display system in carrying out its capital programming process. The process is concerned with the formulation of a six-year programme that includes all of the city's capital projects, and the management of a capital programme implementation process by reporting, scheduling, and providing a method of tracking and monitoring the projects.

Computer models and data base systems have been increasingly used in urban and regional planning. According to Nijkamp and Suzuki, a new use in the context of decision support systems and artificial intelligence systems (e.g., expert systems) is evolving and is helping to make computer models an important component of the planning process. As software packages, decision support systems spur on the practice of forecasting, financial planning, planning models, and operations analysis. Computers, artificial intelligence systems, or robots are increasingly used in the fields of strategic planning, estate planning, geology, engineering, medicine, and computer hardware design.

There are four reasons why it is difficult to use computer models: (a) the problem of accepting computer output as fact; (b) the cost involved; (c) poor documentation by systems modellers and programmers; and (d) the use of quantitative data, as opposed to qualitative data.

In planning, the use of microcomputers is becoming evident. Some of the applications of microcomputers are word processing, numerical analysis using an electronic worksheet (e.g., VISICALC and SUPERCALC), and data base management and information retrieval. Spreadsheets are useful for checking the results of small-scale surveys where calculation might otherwise need to be carried out manually.

Microcomputers can reduce the cost of modelling. But their main constraints are slow processing speed and limited storage capacity.

Evaluation of Information Systems for Urban and Regional Planning

The costs of installing and maintaining computer-based information systems necessitate that the experiences of other systems developers or organizations in the development, use, and application of such systems be evaluated and studied. However, it is difficult to measure the cost-effectiveness of information systems, because the ratio of the costs of providing improved information to its benefits (e.g., tangible planning benefits, savings in financial and manpower resources, and increase in output) is difficult to determine. Furthermore, it is difficult to determine the usefulness of information systems and the nature of the benefits that they may bring. Nijkamp is of the opinion that the value of an information system cannot be properly judged without taking into account and evaluating the costs and benefits of all relevant courses of action. Suzuki suggests that user-managers should continually review systems costs, response time, volume of work processed, and other performance measures, so as to determine whether the information system is within expected response time and cost limits.

A more reasonable approach would be for planners to first undertake feasibility or case studies, and then to develop prototype or pilot information systems. Hopefully, this experience may provide advice as to which systems are most appropriate, most cost effective, and most useful for urban and regional planning. It may also ensure that there are short-term benefits, especially in terms of meeting the immediate demands of planners for data which largely do not exist.

ASIAN AND PACIFIC PERSPECTIVES

Information Requirements for Urban and Regional Planning

The information required for urban and regional planning in each Asian metropolitan region varies according to the planners' conception of the planning process, the time horizons of the plans, the orientation of the plans, and the specific subject of the plans. A consideration of the metropolitan plans in each of the four Asian countries helps to define their information requirements.

In the Bangkok metropolitan region, various types of data are significantly featured in the regional planning study for the Sixth Five-Year National Economic and Social Development Plan, 1987-91. These include data on population, labour, income and expenditure, transport and communications, infrastructure and energy consumption, housing, and organization and administration.

Plan preparation for the Kelang Valley Perspective Plan for the period until the year 2000 concentrated on collecting data for sociophysical urban planning and for the formulation of regional policies and strategies. The emphasis of the plan is on population, economy, housing, transportation, utilities, environment, urban development, and land use. The principal statistical data required for urban planning were those on population, labour, household income, housing, manufacturing, government services, agriculture, mining, water supply, electricity, telecommunications, education, health, and transportation. These data were considered to be adequate and relevant by the Kelang Valley Planning Secretariat in its attempt to produce the perspective plan.

The Metropolitan Manila Regional Development Framework Plan, 1983-92 is a structure plan which has been prepared by the Metropolitan Manila Commission (MMC). The plan's function is to provide a detailed basis for the formulation of local plans and line agency programmes. The plan aims to bring about economic growth, improve the quality of life, and improve the urban structure. The plan is backed up by secondary data on Metropolitan Manila's physiography (location and structure, physiographic characteristics by zone, and land use and urban growth patterns), environment, population, socioeconomic conditions, infrastructure services, utilities, and social services (housing, health and nutrition, education, public safety, and parks and recreation).

The Capital Region Arrangement Master Plan for the period until the year 2003 is the first master plan for the Seoul metropolitan region. Its intention is to reduce the overconcentration of population and business in the Seoul metropolitan region and to induce a balanced development throughout the whole country within a period of twenty years. Its policy emphasis is on redistribution of population and industries, allocation of cities of 50,000 or more population, urban development, division and functionalization of subregions, environmental conservation, and construction of regionwide facilities. Data for planning in the Seoul metropolitan region includes natural environment (e.g., environmental conditions and natural resources); human resources (e.g., population size, structure, and distribution); industry and economy (e.g., industry, income, trade, and finance); land and space use (e.g., urban distribution, village location, and land use); network system (e.g., transportation, communication, and energy); public utility (e.g., housing, water supply, sewerage system, waste disposal, and marketing); social welfare (e.g., medical and welfare facilities, environmental protection, and disaster prevention); education and culture (e.g., schools, training facilities, and cultural and gymnastic facilities); recreation and tourism; and public administration (e.g., local government organization, manpower, and finance).

This evidence supports the view that information requirements vary according to the emphasis given to the phases in the planning process. The emphasis in the four Asian metropolitan plans is very much on the technical analysis of problems of the metropolitan regions (i.e., diagnosis and prescription) and the detection of problems (i.e., definition or specification of goals and objectives). This concern for plan formulation is reflected in the planning schemes for meeting information requirements for plan formulation. The planning systems should give equal attention to the actual implementation and evaluation of the plans and to meeting information requirements for these phases in the process of planning. Relevant information for plan implementation will include implementation indicators (i.e., inputs, outputs, and costs); utilization indicators (i.e., numbers and types of beneficiaries, and kinds and amounts of benefits); and involvement indicators (i.e., amount and kind of involvement of intended clients and others). Information for plan evaluation and control will include performance indicators (i.e., kind, quantity, and quality of services provided, costs of providing such services, benefits and damages arising from successes and failures in the achievement of targets, and operating bottlenecks associated with failures), and the reasons why project effects and/or impact were or were not achieved during and after project implementation or *ex post* evaluation.

Problems of Data Availability

Striking parallels exist between the data problems in the four Asian countries. While a considerable amount of data has been devoted to socioeconomic conditions at a national level, the data has not been extended to a regional or local dimension. Problems of lack of systematic and disaggregated data (e.g., population, income patterns, employment, migration flows, and industry) and lack of consistency and standardization of data sources in terms of time, geographic coverage, or definition, predominate in planning research or studies in the four metropolitan regions. It is, therefore, particularly important to increase the level of detail in such data, so as to increase the accuracy and quality of data involved in urban and regional planning in the four countries.

Bangkok metropolitan area

The data management problems in the Bangkok metropolitan area are defined as:

(a) Lack of comparability of data sources due to differences in the boundaries or area of jurisdiction of local governments (including the BMA), central government agencies, and state enterprises.

(b) Lack of data integration among administrative agencies.

(c) Lack of socioeconomic data on a disaggregated level (i.e., from the commune level, such as the Khwaeng of the BMA; or from the block level, as in tambons).

(d) Lack of appreciation of the value of producing and publishing spatial statistics.

(e) Differing frequency of censuses (e.g., the Population and Housing Censuses are spaced ten years apart; the Agricultural Censuses, fifteen years apart; the Industrial Censuses for Bangkok, Nonthaburi, Pathum Thani, and Samut Prakan, three years apart; and the Trade, Business, and Services Censuses for the urban areas, fourteen years apart).

(f) Lack of social and environmental data.

Kelang Valley

Although the establishment of the Kelang Valley Information System (KEVIS) in Malaysia means that information management is given a high order of priority in the Kelang Valley Planning Secretariat, the quality of planning information still needs improvement. Analysis of the existing data reveals the following problems:

(a) The data remains restricted to the requirements of the Kelang Valley Perspective Plan and does not seem to fit the parameters of subregional or district planning. Considerable efforts have to be made to improve the usefulness of data for subregional or district planning. Attempts are now being made to collect socioeconomic data on a disaggregated district and parish area (mukim) level. For instance, a primary survey is being undertaken in Gombak district to collect data on registered and illegal industries, commercial premises and their ownership, and squatters. Supplementary data on the district are being compiled through consultations with district departmental agencies, land use surveys, aerial photographs, and reports on local socioeconomic and physical conditions and on proposed projects.

(b) The obtaining of current data on squatters, landownership and owners' addresses, and population by ethnic group proves difficult, since it involves time, manpower, and money. Thus updated data on these topics are not available.

(c) There is lack of data on home ownership by ethnic group, which is required for planning under the New Economic Policy.

(d) The accumulation of time-series data for KEVIS needs attention. Historical trends data which are crucial for elucidating causal relationships and explaining social phenomena in the Kelang Valley are available only from 1970 onwards.

Metropolitan Manila

The data problems in the Metropolitan Manila Commission largely relate to the quality of the data base for planning.

(a) The Regional Development Framework Plan was dependent on secondary sources (e.g., censuses and previous planning and agency studies) which were considered to be deficient in terms of improving the acceptability of the plan. First, the use of census and socioeconomic data produced by the National Census and Statistics Office may have failed to improve the MMC's data base for plan making, because of the time interval in census taking, the time lag in the publication of census results, and data conflicts or inconsistencies. Censuses and surveys are conducted only periodically (e.g., the Population Census every five years, and the Economic Census and Household Income and Expenditure Survey at different intervals of shorter or longer duration). The census results also are not made available immediately. For example, the 1980 census results were released only in 1983; the 1975 economic census results were published in 1978. The census data also illustrate conceptual confusions and differences in sampling design (e.g., the definition of employment, unemployment, self-employed, unemployed, underemployed, and literacy). Second, confidence in secondary sources was further eroded as the survey results published by research institutions and consultants were widely divergent or conflicting due to variations in coverage, definitions, and sampling methods. Third, because of the nationwide orientation of the statistical and line agencies, there is a clear tendency towards the production of aggregated data. Thus, disaggregated socioeconomic data on a micro level (e.g., barangay) are not readily available. The problem is compounded by the inconsistency of sectoral data (e.g., nutrition statistics prepared by the Ministry of Health differ from those given by the Food and Nutrition Research Centre).

(b) The Regional Development Framework Plan's data base formed the basis of the Capital Investment Folio (CIF) process. Past attempts to place the Capital Investment Folio on a firm data base have been hampered by the lack of reliable information about projects and programmes. A Metropolitan Manila Physical Survey Project is currently undertaking an inventory and mapping of existing infrastructure, utilities, social service facilities, public and private enterprises, and land values. This project is expected to improve the CIF data base.

(c) The lack of accurate operational data has severely affected programme planning in the MMC. Examples of such data are barangays, traffic and transportation, environmental sanitation, solid waste management, health care, flood control and drainage, police and fire prevention, and engineering and infrastructure. Greater use of such data would suffer from the problem of uncertainty over the capability of the Office of the Commissioner for Planning to strengthen information flows, establish a regular reporting system, ensure the better coordination of data sources, and integrate data generated by the operations centres.

(d) Apart from the compelling need to improve the data base for planning, there is the question of how to develop the MMC's capability in mapping. For example, a capacity is needed to prepare large-scale base maps, thematic maps, cadastral maps, and barrier maps, and conduct an inventory of existing maps of Metropolitan Manila. The MMC has to make extensive use of mapped information in formulating and updating land use plans and zoning regulations.

(e) With regard to improving the local governments' capability for local development planning in the metropolitan area, the MMC has developed guidelines for steering the local planning process. City and municipal development plans must satisfy the guidelines. It was recognized that planning around the guidelines could systematize the data collection and data presentation and thereby facilitate data integration, but the data requirements are very complicated and sophisticated both in form and in substance. For example, local governments are expected to process map and numerical information, describe the existing land use pattern, and determine potentials for further development.

Seoul metropolitan region

In the Seoul metropolitan region, finding ways to meet the planning demands for information on the subregional or local conditions is among the most pressing problems facing planners. To promote a more effective metropolitan development planning process, attempts should be made to overcome particular problems:

(a) There is an imbalance between large demand and inadequate supply of subregional or local information, particularly in such areas as natural resources, economic activities, goods and service flows, and manpower movements.

(b) In some sectors of the economy it is not always possible to obtain accurate and consistent data (e.g., industry, income, employment, social welfare, environment, land use, and land prices). For instance, the air and water pollution data for Seoul metropolitan region supplied by the ministries and the private research institutions often differ.

(c) Local units such as counties, towns, townships, and villages offer no concrete or detailed information in terms of space, time, or subject area. It is difficult to obtain area-based economic data (e.g., industrial production, employment, per capita and per household income, interregional goods, service, or money flows, and recreation and tourism).

(d) The requirement for time-series data could not be satisfied because government agencies and research institutions do not preserve old data (e.g., data covering a ten-year period).

(e) There is a need to fulfill the requirement that contact between users and suppliers of information should be viewed within the organizational context. Better coordination or cooperation is a helpful way of approaching this issue.

Data Collection Systems

The similarity of data collection systems in the four Asian metropolitan regions is striking. Their approach to gathering data is secondary analysis. Secondary sources are used by the planning organizations as a basis for urban and regional planning. Population censuses, official statistics, continuous and regular surveys (e.g., general housing surveys, family expenditure surveys, and labour force surveys), datasets derived from administrative records, and studies made by research institutions and universities are the basic tools for planning in the four Asian metropolitan regions. These are good sources of information, but most of them carry aggregate information. The advantages of censuses as a data source are completeness and standardization of coverage. However, there is some concern about the accuracy of census data at the local and regional level (which may be due to poor data collection techniques). There are also problems caused by the long intervals between censuses. Censuses can be out of date before they are published. Administrative records are useful to planning activities, but they are poorly updated or incomplete.

In Bangkok, administrative procedures are used by the Bangkok Metropolitan Administration (BMA) to obtain information from the districts. The districts are assigned to collect data such as population, housing, new buildings, and income, and then to submit them to the BMA headquarters monthly. The district sectoral offices collect data on medical services, public health, education, public works, sewerage and drainage, public sanitation, social welfare, and finance, and the results are submitted annually to the respective BMA departments. Census data are not a useful tool for the BMA because of the long intervals between censuses.

In the Kelang Valley, most of the data for the Kelang Valley Information System's data base are generated from secondary sources. Statistical, household, and social survey data are produced by the Department of Statistics and the Socio-economic Research Unit of the Prime Minister's Department. Other information sources are the Selangor State Planning Unit, the Kuala Lumpur City Hall, and the district offices. Land data are collected and transmitted to the Kelang Valley Planning Secretariat by the Office of the Director of Land and Mines at the Kuala Lumpur City Hall and the district offices, via the Selangor State Land Office. Field visits, limited questionnaire surveys, aerial photographs, record examination, and administrative procedures were used in the planning exercise for the Gombak District Development Plan.

In Metropolitan Manila, the secondary sources that have been used by the Metropolitan Manila Commission in preparing the Regional Development Framework Plan are censuses and related surveys, local government socioeconomic profiles, data from previous regional, transport, and sectoral planning projects, and data from consultants' work on the Capital Investment Folio. Administrative records (e.g., applications for locational clearances) and field surveys (e.g., "foot," "windshield," or "felt" observations) are used to obtain land use and zoning information. A survey of idle lands was conducted as part of an urban land management study funded by the World Bank. The Capital Investment Folio process is based on financial data (e.g., past income, expenditure, and committed or proposed projects) obtained from the national agencies and local governments concerned. Another important data-gathering technique used is personal contact through the Interagency Technical Working Group, which is composed of the MMC Governor, Vice Governor, and Commissioners for Planning and Finance, and representatives of the National Economic and Development Authority, and the ministries and attached corporations. This is a useful method for establishing information links between the CIF team and the officials of the national sectoral spending agencies. Along with personal contact, a project reporting system is used by the Metropolitan Manila Commission to facilitate and systematize the collection of implementation and monitoring and evaluation data for the Capital Investment Folio process. However, the reporting system cannot guarantee that people will keep detailed records and report the results accurately. From the Environmental Sanitation Centre's experience, one of the most difficult points to get across to those engaged in solid waste management is the importance of accurate data. Some local offices allegedly submit reports based on imprecise figures and inaccurate records on the number of truckloads of wastes collected and disposed of in their respective areas of operations. In the Metropolitan Manila Commission, too, some operations centres are dependent on administrative records, but these are inadequate for the requirements of planners. For example, the Action Centre for Infrastructure Development uses the approved building permits, mechanical and electrical permits, sanitary permits, plumbing permits, certificate of occupancy permits, and permits to construct fences, sidewalks, and signboards, to summarize the accomplishments of infrastructure development projects of the local engineering offices within Metropolitan Manila. If administrative records are used, they should be designed in categories meaningful to planners and analysed in terms of the needs, problems, and priorities of the offices. Surveys are only conducted by some offices (e.g., the Traffic Operations Centre) as the need arises and as their finances allow.

In the Seoul metropolitan region, urban and regional planning is based on data from three sources: (a) documentary survey (i.e., survey of existing literature); (b) report survey (i.e., census and other statistical data); and (c) field survey (i.e., participant observation and interviews). Statistical data are collected by the Bureau of Research and Statistics, the Economic Planning Board, the Ministries of Construction, Agriculture and Fishery, Home Affairs, Trade and Industry, Social Affairs, and Transportation at the national level; by local autonomous bodies at the local level; and by the Bank of Korea, Industrial Bank, Chamber of Commerce and Industry, research institutions, and some public corporations. The Bureau of Research and Statistics or the Economic Planning Board coordinates the data collection activities of these agencies. Data relating to space and construction are collected through administrative channels. Participant observation is used for environmental fact-finding, while interviews are used to explore in depth the attitudes and awareness of selected families or categories of people in the region. Some practical examples of problems which arise with the use of census and other statistical data can be drawn from the Seoul metropolitan region's experience. Census taking (e.g., the population and housing census, and the mining and industrial census) involve the enumeration of a complete population. In view of the numbers involved the range of information that can be collected is necessarily limited. Owing to an inability to provide small area statistics, census data could only be used for general purposes in urban and regional planning. In the social welfare sector, data are not easily available because the field is rapidly changing and the survey formats are not standardized.

Data Processing and Analysis

Recent experiences in the four Asian metropolitan regions suggest that whereas data are usually collected for planning exercises, too little attention is given to processing and analysing data that could be of value to planners. Because of inadequate planning and implementation of the data-cycling process, limited resources, and the lack of trained manpower and effective data processing equipment, the dissemination of the resulting information tends to be delayed. Such delays totally defeat the purpose of data collection, which is the timely use of the findings for decision making and planning.

Data processing

In practice, the four Asian metropolitan regions still rely on hand sorting and processing devices to process administrative and planning data.

For example, in the Department of Policy and Planning, Bangkok Metropolitan Administration, manual data processing systems or conventional office machines are used for administrative record keeping (e.g., records maintenance for personnel, office cars, machinery, and equipment). Computers are only used for the Land Development Tax Project and some *ad hoc* projects.

In the Kelang Valley, both manual and computerized data processing systems are used by planning and administrative agencies. The data centres at the Prime Minister's Department, the Selangor State, and the Kuala Lumpur City Hall have adopted computer systems to process and analyse quantitative data. Computer packages, such as the SPSS, SAS, CLIO, MPSX, ECOT, IFPS, and IMS have been acquired to handle the tabulation and analysis requirements of the information systems. However, the high costs of systems design and conversion (including hardware and software purchases and personnel requirements), the need to clean and standardize the data, shortage of trained information systems personnel (e.g., systems analysts, engineers, and programmers), and the difficulty of linking or interfacing the different hardware, software, and application programmes (although the SETIA system was recently installed to solve this problem) are persistent organizational and technical problems. Manual systems are used for administrative and statistical procedures at the district or local offices. Since the work of data collection and processing in the district or local offices is relatively simple and light, the data are amenable to hand manipulation. Nevertheless, the problems of data processing and analysis would still remain. It would appear therefore, that, even at the district or local level, the requirements of any information system cannot be met without the support of appropriate technology for data processing and information dissemination. Timely and reliable information about local conditions is indispensable for ensuring the progress and cost-effectiveness of the information systems in the Kelang Valley.

In the Metropolitan Manila Commission, the integration or coordination of data bases and related activities conventionally dealt with in separate plans, programmes, or projects, is essential for effective metropolitan planning. At present, the work of data collection and processing remains fragmented and disorganized. The programme offices and operations centres work more or less independently of each other, each collecting and processing data manually and with specific purposes in mind. The Office of the Commissioner for Planning has recently installed a computer for the storage and retrieval of the Capital Investment Folio data. The key to generating and disseminating this information may well be an information system. Using a computer-based information system would prove crucial once the data were organized and documented. Without an integrated information system, however, access to the data held by the programme offices and operations centres would be impossible and their future use for metropolitan development planning or project management would be jeopardized. For the information system to be truly effective, it needs to be designed and developed in relation to the needs of the programme offices and operations centres.

In the Seoul metropolitan region, computers or electronic calculators are used for processing statistical data and survey results.

Data analysis

Sophisticated analytical techniques and models needed to analyse and interpret datasets for urban and regional planning are in some ways difficult to use in the four Asian metropolitan regions than the simple statistical techniques, as the former often involves more complex data and skill in data manipulation. Such models include regional input-output analysis, cost-benefit analysis, the gravity model, regional econometric models, regional growth models, and programming models, which are "gluttonous" in their consumption of data.

In the Bangkok Metropolitan Administration, it was not always possible to adopt the techniques and methods of data analysis used by regional economists. The BMA had to rely on the use of common statistical techniques and basic analytical methods (e.g., percentage and relative measurement). However, the data from the Bangkok Metropolitan Region Study was analysed by means of the Keynes macroeconomic model, the regional input-output model, and shift-share analysis.

The Kelang Valley Planning Secretariat used only shift-share analysis in preparing the Kelang Valley Perspective Plan. It used some aspects of the economic base model in urban centre location analysis at the time the technical papers for the plan were prepared. The Secretariat has often used statistical techniques (e.g., mean, mode, average, correlation, and linear and multiple regression analysis in the SPSS and SAS packages). It sometimes used time analysis for the study of population, migration, Gross Domestic Product, agricultural production, and status of the environment.

Data analysis in the Metropolitan Manila Commission has relied entirely on existing datasets without collecting any new data. The Capital Investment Folio annual report illustrates the use of summary tables, graphs, and simple projections based on alternative assumptions on the rate of economic growth. Economic base models have been used on an ad hoc basis.

In the case of the Seoul metropolitan region, various data analysis techniques have been used in urban and regional studies and plans (e.g., statistical analysis, vector and matrix analysis, calculus and differential equations, input-output analysis, factor and cluster analysis, economic base model, regional shift-share analysis, industrial location and complex analysis, and regional accounting). Computer uses were limited to transportation, population, economics, and industrial location analyses.

Monitoring and Evaluation Systems

Monitoring and evaluation are already part of the planning and project cycles in the four Asian metropolitan regions. Their implementation is the difficulty, and the obstacles are of an organizational nature. Among the obstacles are inadequate and defective methods and procedures of monitoring and evaluating plans and projects.

Organization for monitoring and evaluation

In the four case studies, the necessary first step to organize and define the task of a monitoring and evaluation system has been completed.

In the Bangkok metropolitan area, the implementation activities of the district offices (Khet) are evaluated by the Department of Inspector General, which presents the evaluation results to the Secretary of State for BMA.

In the case of the Kelang Valley, the Kelang Valley Planning Secretariat makes every effort to ensure that the development projects in the Kelang Valley conform with approved regional development policies and strategies and, particularly the New Economic Policy.

In Metropolitan Manila, the Metropolitan Manila Commission monitors performance in the implementation of the Capital Investment Folio and in programme and project planning of the different operations centres. For CIF purposes, the monitoring technique used by the Technical Secretariat is to review the physical progress and financial status of programmes or projects. Project evaluation is conducted by the line agencies as they are supposed to have technical expertise in the design and execution of the evaluation as well as the ability to influence the evaluation process. For programme planning, the Institutional, Management, and Information Study Group under the Office of the Vice Governor has devised a monitoring and evaluation programme for the MMC projects. The Immediate Staff of the Office of the Commissioner for Planning is responsible for evaluating projects which are included in its programme plans.

In the Seoul metropolitan region, project monitoring and evaluation under the Capital Region Arrangement Master Plan and its Implementation Plan are assigned to various governmental entities: the city and county governments at the preevaluation stage; the governments of Seoul, Inchon, and Kyongki Province at the middle evaluation stage; the Ministry of Construction at the post-evaluation stage; and the Capital Region Arrangement Inquiry Commission at the final evaluation stage. In a city or county, projects are monitored and evaluated by the Project Department. A project inspector, who is appointed by the Department, supervises the progress of projects.

Since the evaluations are conducted by the four planning organizations' own in-house staff, the main issue concerns the choice of evaluators. The use of in-house staff presents obvious disadvantages, particularly with regard to evaluator bias. If the organizations had hired outside evaluators it might have been possible for such evaluations to have a measure of independence which an evaluation system ought to have. With in-house evaluation, critical assessments of programmes and projects are particularly difficult to make. There is always the possibility that steps may be taken to control the evaluation and hide potentially embarrassing findings. Finally, involving the staff in evaluation allows the possibility of their becoming involved in office politics. It is quite possible for the staff to make compromises that will sacrifice professional evaluation standards.

A major advantage of using in-house evaluators is being able to bring about programme improvements while the evaluation is underway. As the staff evaluators discover ways in which their programmes could be strengthened, they could immediately start to take measures necessary to make improvements. As active participants, staff evaluators also develop some important evaluation skills. They will also take steps to ensure stronger links among various administrative and technical units. Finally, staff members know and understand their organization in a way that outside evaluators never can. If the staff members support the evaluation sincerely and become fully involved, the evaluation can provide an in-depth assessment of the programmes that no external evaluation can do.

Data for monitoring and evaluation

Different kinds of data are required by the Asian metropolitan planning organizations in evaluating programmes and projects.

The Bangkok Metropolitan Administration requires data relating to the law, order, and logic of sites, products, accounting and auditing, and staff capability.

The Kelang Valley Planning Secretariat collects two kinds of data for project monitoring purposes: (a) data on socio-economic conditions (e.g., squatters, housing, trade and commerce, and industry) and physical conditions (e.g., land, basic facilities and public utilities, transportation, and environment); and (b) data relating to the progress of Federal and State Governments' projects and special projects.

The Metropolitan Manila Commission's Capital Investment Folio project evaluation system sets five criteria (i.e., feasibility, compatibility with the Regional Development Framework Plan, impact on equity, economic viability, and financial viability), which require extensive information. Information in the Capital Investment Folio project consists of forms pertaining to the physical progress and the financial status of projects or programmes. With regard to project or programme planning, documentation is very poor. Although information about the impact or effectiveness of projects or programmes is essential for effective management of evaluations, the Metropolitan Manila Commission or its operations centres do not have the capabilities, or at least have not manifested inclinations in establishing a project or programme evaluation documentation system. A well-planned, comprehensive documentation system may involve the collection of surveys and testing data on a very large sample of population, as well as the design of evaluations and the analysis of data.

Project evaluation in the Seoul metropolitan region uses such performance indicators as the effectiveness of population reduction and the degree of population resettlement and/or migration to outlying areas.

It is observed that the four planning organizations provide information about the inputs and outputs of projects. This is sufficient for checking on whether the intended resources, activities, and services are in conformance with the project plans. The information is not sufficient, however, for understanding the impact or effects of completed projects. In addition to the quantifiable economic elements, project evaluation should take adequate account of the sociological and environmental impacts of projects. The questions which are typically asked in impact evaluations are the following: What socioeconomic effects or social benefits took place as a result of the project? Have the project effects spread beyond the original area targeted in the project? Was the change sustained? Was the change brought about by factors other than the project?

The direct effects or physical outputs of projects are easy to monitor and evaluate with simple statistical techniques. But the measurement of indirect effects of projects is more complex. Perhaps it can be done through the compilation of indices of key variables (e.g., employment and income) in the project areas.

Feedback of the evaluation results

In the four planning organizations studied, programme or project reporting and evaluation have been accepted practices for many years, but, for some reasons, the feedback of evaluation results has been less common in those organizations. A feedback process has to be built in the monitoring and evaluation systems of the organizations.

For those involved in monitoring and evaluation, communicating or disseminating the evaluation findings within the project structure (i.e., to project managers, planners, implementors, and higher authorities; to outside government agencies, to international aid or donor agencies, or to project beneficiaries), and evaluating their response is an important part of measuring programme or project effectiveness. In order that the evaluation findings and recommendations be used effectively for improving project performance, culturally and politically acceptable channels of communication should be established to disseminate evaluation results. A feedback process helps the people concerned to check the evaluation results and reconfirm the findings, make any necessary corrections, and improve their performance. Even with a good evaluation design and well-supervised evaluation, there is room for error or misinterpretation of data. Therefore, the evaluators have to become exceptionally skillful in managing this feedback process so that it will result in learning and change, rather than defensiveness and anger on the part of those affected by the evaluation results.

Thus, the role of the information system is to feed back information to the project management level, concerning the reactions and attitudes, response rates, and participation of beneficiaries in project planning and implementation.

Development of Computer-Based Information Systems in Asian Metropolitan Regions

Despite the pervasive need for accurate, timely, and focused information in urban and regional planning, information systems in the four Asian metropolitan regions are still very much underdeveloped. The costs of developing computer-based information systems for planning are great, and the inadequacy of financial and information resources, limited information technology, facilities, and technological know-how, and lack of awareness of the value of information systems are among the fundamental constraints to improving information management in the four Asian metropolitan regions.

Bangkok Metropolitan Administration's information system

The need of the Bangkok Metropolitan Administration is for improving the organization and management and expanding the function of the existing information centre so that it will yield information useful to planners. The function of the information centre at the Department of Policy and Planning is to collect information from central and local statistical agencies, special projects, research institutions and universities, and libraries. This function should be expanded to include elements such as techniques and procedures for systems development and for systematically collecting, updating, processing, and distributing planning information.

Kelang Valley Planning Secretariat's information system

In 1983, the Kelang Valley Planning Secretariat established the Kelang Valley Information System. KEVIS is the first data bank and urban information system in Malaysia concerned with facilitating urban regional development planning, monitoring, and coordination of developments in the Kelang Valley. It is an integrated information system with five major semi-independent data based systems: (a) Land Data System; (b) Statistical Information System; (c) Project Monitoring System; (d) Property Information System; and (e) Computer Aided Mapping System.

In view of limited computer personnel and financial constraints, a three-phase implementation strategy is being followed. Phased for implementation in 1983 were the Land Data System, the Computer Aided Mapping System, and the Statistical Information System; in 1984 the Project Monitoring System; and in 1985/86 the Property Information System.

The Land Data System has four data based subsystems; namely, quit rent administration system, alienated land information system, temporary occupation license administration system, and inventory of unalienated land.

The Statistical Information System includes baseline and updated data on socioeconomic development and physical planning (pollution, labour, household income, housing, manufacturing, government services, agriculture, mining, water supply, electricity, telecommunications, education, health, and transportation). It is planned that the data will be linked to some of the computerized maps under the Computer Aided Mapping System.

The Project Monitoring System has two primary activities: (a) the collection, analysis, and monitoring of data and phenomena such as pollution of the Kelang River, squatters on railway land, Malay reservation land, housing, trade and commerce, industry, basic facilities and public utilities, unutilized town and government reserve land, transportation, and environment; and (b) progress and costs of projects of the Federal and State Governments, and of special projects.

The Property Information System will consist of data on building structure on land.

The Computer Aided Mapping System involves the digitizing and drawing of important maps in the computer for purposes of efficient storage, retrieval, special data processing, and visual reference during meetings and decision making processes. The attribute files and maps to be stored include those required during the implementation stage (e.g., population, squatters, land use, housing, location and relocation of factories, traffic volume) and those required during the planning stage (e.g., status of land, land use, Malay reserves, land application, cadastral survey, administration, election boundaries, physical characteristics, public utilities, population, and squatters).

The Kelang Valley Planning Secretariat's initial experience with KEVIS has revealed the following problems:

First, there is a need to clean, update, and prepare the data according to a standardized format to make them useful for planning purposes (e.g., land records and land administration processes). This task involves time, manpower, and funds. It also requires the cooperation of various information sources (e.g., the Department of Statistics, Selangor State, Kuala Lumpur City Hall, and the district and local offices).

Second, socioeconomic data on a disaggregated district and mukim level are not available. A primary survey had to be undertaken in Gombak district to collect information on registered and illegal industries, commercial premises and their ownership, and squatters.

Third, systems design and conversion are costly and time consuming processes. These tasks need to be undertaken for the computer systems of the Prime Minister's Department, Selangor State, Kuala Lumpur City Hall, and the local and district offices. It is also costly to purchase hardware and software and employ technical personnel. KEVIS shares the computer facility with the Prime Minister's Department's mainframe computer (IBM 4341 CPU 8MB and 3032 CPU 4MB).

Fourth, training is required for different kinds of personnel who will be involved in the development and management of KEVIS. KEVIS is backed up by a small EDP staff (two systems analysts, three programmers, and four other support staff). The relatively high rate of technical or systems personnel turnover tends to affect the KEVIS in terms of both the quality of information and the extent to which the system is being used.

Metropolitan Manila Commission's information system

In the Metropolitan Manila Commission, there are internal institutional problems that must be considered as constraints to integrated information systems development. Primary among these is the fragmentation of responsibility for data base development, with different offices and operations centres holding responsibility for data collection, organization, processing, and analysis. The Metropolitan Manila Commission has two types of information systems for planning. One type is the general-purpose information system being developed to support the Regional Development Framework Plan and the Capital Investment Folio processes; and the other type consists of *ad hoc*, partial information systems being developed by the different offices and operations centres for project planning purposes. In 1982 the Integrative Planning Service of the Office of the Commissioner for Planning submitted a proposal for the design and implementation of a computer-based information system for general use of the various units of the Office and for specific application to the Capital Investment Folio project. A computer was installed recently. This five-year project involves three stages: Document storage and retrieval stage (two years); Data storage and retrieval stage (two years); and Data support stage (one year). As more experience is gained in using the information system, it is probable that the improved combination of technical support capabilities and data base system will permit transformation of the information system into a decision support system. Apart from this information system, a computerized data bank and an automated mapping system is being established for the Metropolitan Manila Physical Survey Project (MMAPS). The MMAPS is part of the Capital Investment Folio process and is financed through World Bank Urban III loan proceeds. It is concerned with inventorizing and mapping existing infrastructure, utilities, social service facilities, public and private enterprises, and land data.

Ad hoc information systems are made up of several smaller data bases that are maintained by the separate sectors, offices, operations centres, or special studies within the Metropolitan Manila Commission. Each project, programme, office, operations centre, or internationally-funded study collects data as part of its operational activities and according to its particular needs. The quantity, extent, and accuracy of the data collected varies, depending on the use for which it is compiled. Some special studies (e.g., the Solid Waste Improvement Programme, the Urban Transport Terminals Study for Metropolitan Manila, and the Metropolitan Manila Urban Transport Improvement Project) have created their own data bases.

Fragmentation of the data bases in the Metropolitan Manila Commission leads to higher costs, prevents economies of scale, leads to too much variety in equipment or hardware purchased, and causes duplication of data and information management functions in an environment of scarce financial, technological, and information infrastructure and manpower resources.

Seoul metropolitan region's information system

In the Seoul metropolitan region, a project is now underway to collect data required for the formulation of the Capital Region Arrangement Master Plan. The Korea Research Institute for Human Settlement is conducting the project and is working closely with the Korea Advanced Institute of Science and Technology in computerizing the data collected. It is anticipated that, by the end of 1985, data collection will have been completed and host institution staff will have gained the technical skills and experience necessary to ensure the implementation of an information system for metropolitan development planning.

CONCLUSION

Information management is still a poorly neglected function of urban and regional planning in Asian developing countries. Although some kind of information systems, data banks, or libraries exists, these are not designed and organized for use in urban and regional planning. These are mostly used for general administration and not for urban and regional planning. Some are ad hoc, special-purpose systems which are created to meet emergency planning or the international aid agencies' requirements. This was found to be the case in three Asian metropolitan regions, i.e., Bangkok, Manila, and Seoul. Only the Kelang Valley in Malaysia has initiated a computerized data bank and information system for urban regional planning. The Kelang Valley Information System is the first information system of its kind in Malaysia, and its objective is to access and provide information essential for planning, monitoring, and coordinating activities and developments in the region.

There are two critical factors which appear to impede the development and implementation of information systems for urban and regional planning in the Asian metropolitan regions. The two factors are:

(a) Lack of awareness and understanding on the part of policymakers, planning or project managers or administrators, planners, and other staff, of the value, use, and application of computer-based information systems in urban and regional planning.

(b) Limited resources (e.g., shortage of funds for the adoption of information technology and lack of information or communication infrastructures) compounded by inadequate design and implementation of information systems as a result of lack of data for planning, shortage of skilled personnel, lack of technological know-how, and lack of administrative coordination of existing data banks.

The development of information systems is frequently stymied at the policy or top management level, the level where it should have most support. If there is an awareness at the highest level of planning organizations of the value of information systems in urban and regional planning, however, the support or motivation for adoption and utilization of computer-based information systems which address planners' needs, may carry the information systems project through. To develop and maintain information systems which would effectively meet planners' needs, would require an appropriate policy for adopting and utilizing information technology, extensive commitment of organizational and financial resources, and organizational preparation. Thus, the development of information systems for urban and regional planning must be set within the framework of the planning organizations' information, budgetary, and staffing policies. Lack of financial resources constrains the responsiveness of planning organizations to adopt information technology. Finally, the capability of planning organizations to organize and manage information systems effectively is critical. Information systems projects require trained technical staff and a clear and consistent strategy for training managers, planners, subject specialists, programme designers, and other systems personnel on the management and use of computer-based information systems. In the developing countries it is not easy to recruit and retain qualified systems programmers, systems engineers, systems modellers, and data analysts.

There are solutions to these development and implementation problems. The developing countries can learn from successful developing- or developed-country examples of information systems projects in urban and regional planning or in other subject areas such as urban housing, health, nutrition, family planning, and agricultural programmes. Planning and implementing information systems requires an organized approach and careful analysis of many issues and questions, including the information requirements in urban and regional planning, data collection methods and techniques, data processing and analysis, monitoring and evaluation systems, and technical, financial, and personnel matters. There are significant differences among the developing countries in terms of their socioeconomic, political, and environmental conditions, and therefore, the information management needs of each country has to be separately considered. However, a rational and comprehensive approach to systems design and implementation is the key to successful information systems projects.

Computer-based information systems appear to offer potential for improving the urban and regional planning process in the developing countries. They can assist in organizing, processing, and retrieving data; maintaining data bases for planning; performing computations or processing statistical data; urban and regional modelling; monitoring performance or outputs in planning and project management; and enhancing planning activities.

Assessment of the cost-effectiveness of computer-based information systems for urban and regional planning in the developing countries is of crucial importance. The criteria for evaluating the benefits of information systems includes accessibility, comprehensiveness, accuracy, appropriateness, timeliness, clarity, flexibility, verifiability, freedom from bias, and quantifiability of data. Before adopting computer-based information systems, planning organizations must first undertake a feasibility study. Then they must develop a prototype or pilot information system which can serve as a model for designing information systems. Only then can the planning organizations select and adopt the system which is most appropriate, cost effective, and useful for urban and regional planning. A more modest, action-oriented information system, which follows a modular and incremental design strategy and which requires minimum information may be more appropriate to the developing countries. Studies on the potential, limitations, and applications, along with studies on evaluation and cost-effectiveness of information systems for urban and regional planning are becoming widely available. Developing countries can benefit from these studies.

International organizations are increasingly committed to assisting the developing countries in practical programmes and pilot demonstration projects geared to the development of computer-based information systems for decision making and planning. Some United Nations organizations are focusing on research and training programmes that will improve government information systems. Since 1978 the United Nations Economic and Social Commission for Asia and the Pacific has had a programme on government information systems dealing with policy and management issues related to the use of information technology for administration and planning purposes in ESCAP member countries. The programme aims to assist the developing and least developed countries of the region in introducing modern information technology into their government information systems in order to strengthen the governments' ability to plan and manage economic and social development activities. The programme comprises a coordinated set of advisory services and institution building projects aimed at developing the necessary organizational and technical infrastructures for computerization. The programme addresses three distinct groups of countries: developing countries where governments for several years have used computers for administrative purposes on a sectoral and noncoordinated basis (e.g., Indonesia, Malaysia, Pakistan, Philippines, Sri Lanka, and Thailand); the least developed countries where modern information technology only recently has been introduced (e.g., Bhutan, Bangladesh, Maldives, and Nepal); and the small developing countries of the Pacific where information technology has generally not been introduced. The programme includes projects for the computerization of geocoding systems, computerization in specific sectoral areas, and training in geocoding, health information systems, statistical data processing, urban management, microcomputer software, and office automation. A pilot project in Kalutara District, Sri Lanka is underway. It aims to establish a microcomputer based system for decentralized planning and administration and to develop a data base on agricultural resources and a geocoded grid system covering the Horana Division in Kalutara District. The project is designed with the intention of being extended to the other divisions of Kalutara District, as well as to the other districts of Sri Lanka. It will also serve as a model for similar activities in other developing countries.

The United Nations Centre for Human Settlements (Habitat) has a microcomputer software programme aimed at providing support for microcomputer applications to human settlements planning. The programme distributes microcomputer software documentation and conducts training workshops for those who will use the programme (e.g., policymakers, urban managers, planners, and academic staff in charge of human settlements programmes). It also provides backup consultancy for up to six months after the programme is introduced. The Urban Data Management Software (UDMS) package has been designed to meet the needs for data storage, analysis, display, and mapping for physical, social, health, environmental, and land use planning, housing, resource management, and regional planning. The package is written in CBASIC for any C/PM disc operating system which allows it to be used on almost any microcomputer on the market. The National University of Colombia's Habitat Centre, Sri Lanka's Urban Development Authority, and Jamaica's Urban Development Authority are among the institutions that have introduced the programme.

The United Nations Centre for Regional Development has a two-year research project on information systems for local and regional development. Phase I of the project was concerned with problems and issues which were explored and discussed in this synthesis. Phase II (now underway) will address questions of: (a) training needs in data collection and analysis, data processing and retrieval, information dissemination methods, monitoring and evaluation, and designing, implementing, and organizing information systems; (b) the target group for training; (c) the skills and knowledge required; (d) course content or curriculum; (e) training methodology; and (f) trainers for a training course on information systems for urban and regional planning.

Further international development assistance efforts should concentrate on the following activities: (a) establishing networks for regular exchange of information on information systems projects; (b) reviewing training needs and resources and preparing systematic training plans for the developing countries; (c) preparing documentation on the use and application of computer-based information systems in urban and regional planning; (d) evaluating computer-based information systems for urban and regional planning; (e) organizing teams of specialists to offer advice to the developing countries on choosing and testing hardware, systems design and operational procedures, and managing computer-based information systems, and providing assistance with specific projects; and (f) carrying out research aimed at developing flexible and versatile software packages and low-cost hardware for widespread use in urban and regional planning activities in the developing countries.

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